VOL. XXX NEW YORK—THURSDAY, JANUARY 8, 1914—CHICAGO No. 2

The AUTOMOBILE

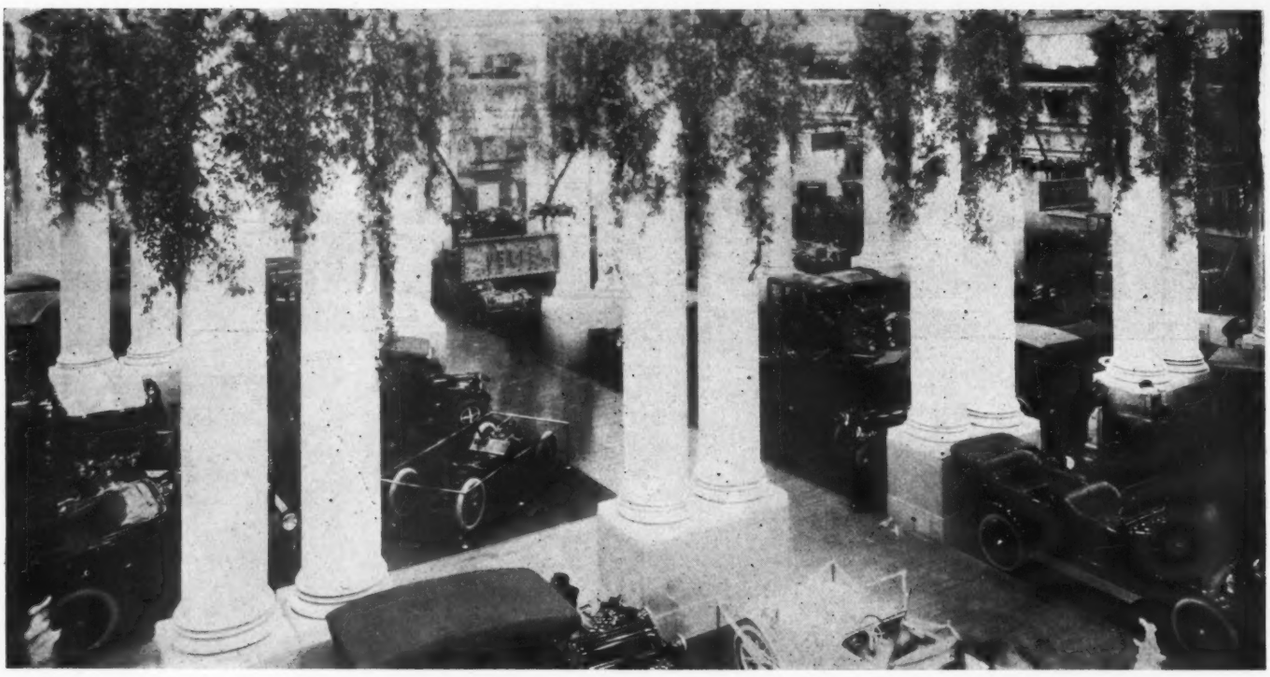
The 4-Floor Show

One Show in One Building Suits New York—Attendance Large—New Things

NEW YORK SHOW, Jan. 6—After 2 weeks of automobile shows carried on simultaneously in two separate buildings over a mile apart a year ago, Father Knickerbocker has this year consolidated his exhibition experience and is contenting himself with a single week of show and in a single building is a remarkable contrast as compared with 1913. Thanks to the Automobile Chamber of Commerce, Gotham has ensconced all of its cars and accessories on exhibition in the Grand Central Palace, time-honored Madison Square Garden going a-begging this year, after having the honor of cradling the motor industry 14 years ago when it was in its swaddling garments. Time and business interests are surely not respecters of persons or sentimental regarding buildings.

The show, which opened Saturday night in the Grand Central Palace, is labeled the Fourteenth Annual Automobile Show and is conducted under the auspices of the Automobile Chamber of Commerce, Inc., the new organization that scarcely a year ago was reared out of the ashes of the National Association of Automobile Manufacturers and the Automobile Board of Trade as the governing body of automobile matters in America.

The present show is a four-floor show, really the first of its kind, in the literal sense of the term, ever held. The Grand Central Palace is a huge block-shaped skyscraper and the automobiles and accessories are exhibited in the first four floors. The two lower floors and a part of the third are given over to gasoline and electric car exhibits, together with a few cyclecars and light cars; and the remainder of



General view of exhibits on the main floor of Grand Central Palace in the Center Court of Honor. The arrangement of other car exhibits on the second floor on gallery can be seen arranged around the sides of the court

the third floor and all of the fourth floor are taken up with automobile accessories and motorcycles and parts.

On the Express Route

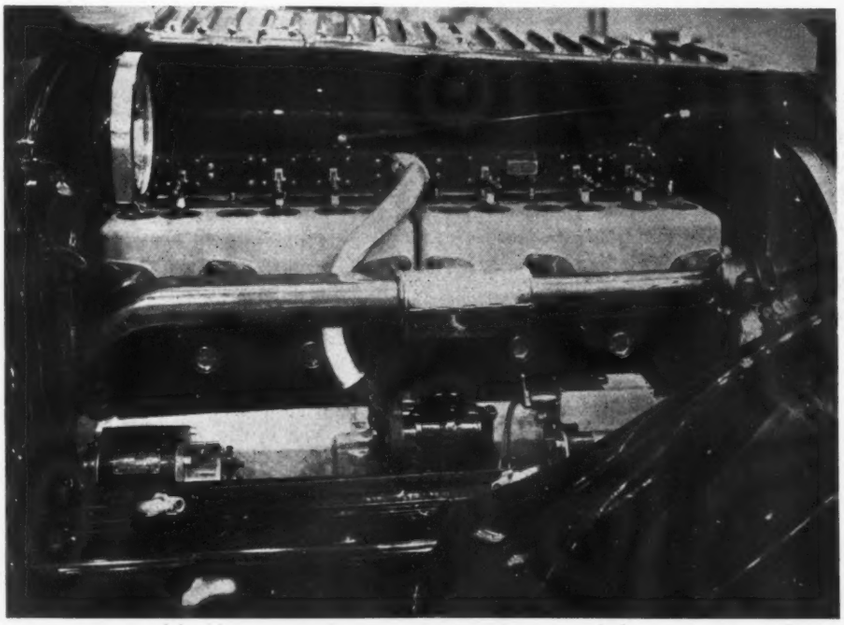
At first thought, exhibiting accessories four floors up is not a very appetizing menu, but the show management has taken the bull by the horns and made the fourth floor up the premier one by having all of the passenger elevators carry visitors to the fourth floor only and refusing to carry any one down. You can take an elevator only to the fourth floor, the elevator man refusing to let you off at the second or third and positively objecting to carrying anyone down. This method, par excellence, gives the fourth floor accessory exhibitors first floor advantages and the daily crowds are as well distributed on the third and fourth floors as they were in the Madison Garden balcony a year ago.

Welcome Beacon Fires

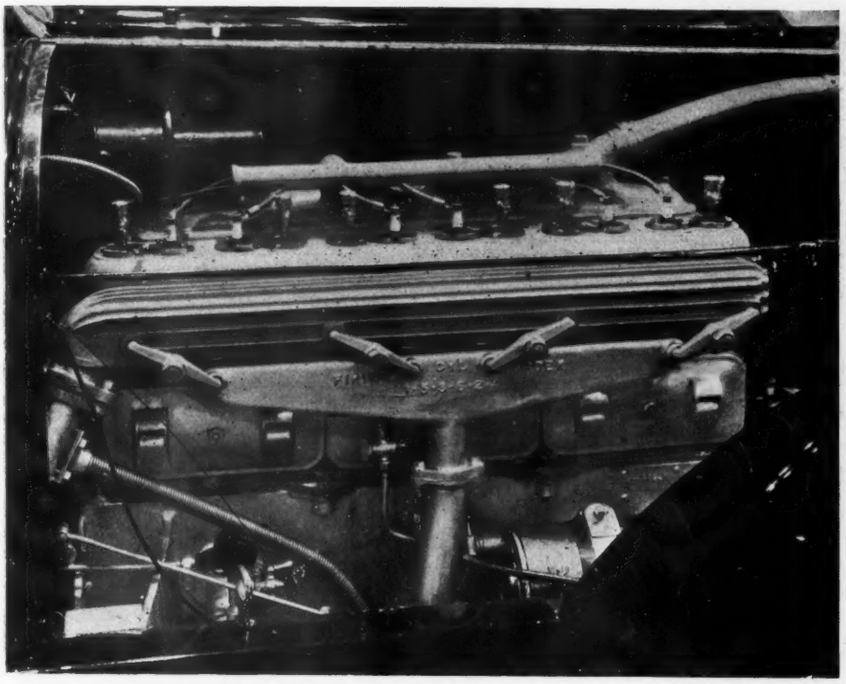
The present fourteenth annual automobile show is not a conspicuous one, rather it might be dubbed a somber exposition of the leading art of transportation, somber not because anyone is carrying a glum countenance—it is all optimism in the Palace—but somber in that the predominating car color is black or dark green, which gives a monotony to the exhibits. There are too many blacks and dark greens. A little folly now and then is welcomed by the wisest men, and in automobile shows a rational sprinkling of body colors is a welcome sight. Paris boasted of her artistically-blended body colors at her recent Salon and London still points to Olympia where color levity was indulged in.

The present show is not all black, there are the whites, the flaming reds, a few canary yellows, some grays and dark browns. Even these show cars are not in general so lavish as in former years, although set a new horizon for luxury in the Longchamps limousine that Locomobile shows as well as in the beauty of the Peerless closed car and the parlor-like Waverley electric, which has one side of the body entirely cut away to give free view to the delicate upholstery and the other fittings of feminine luxury.

There are many other show bodies of the rational order and these, scattered throughout the spaces, increase the general air



New Packard 4-48 motor exhibited for the first time. It follows the lines of the 2-38 type using L-head cylinders cast in blocks of three. Note the neat grouping of the electrical units on the valve side, generator in front, magneto in center, and starter in rear. Note cover plates for valves

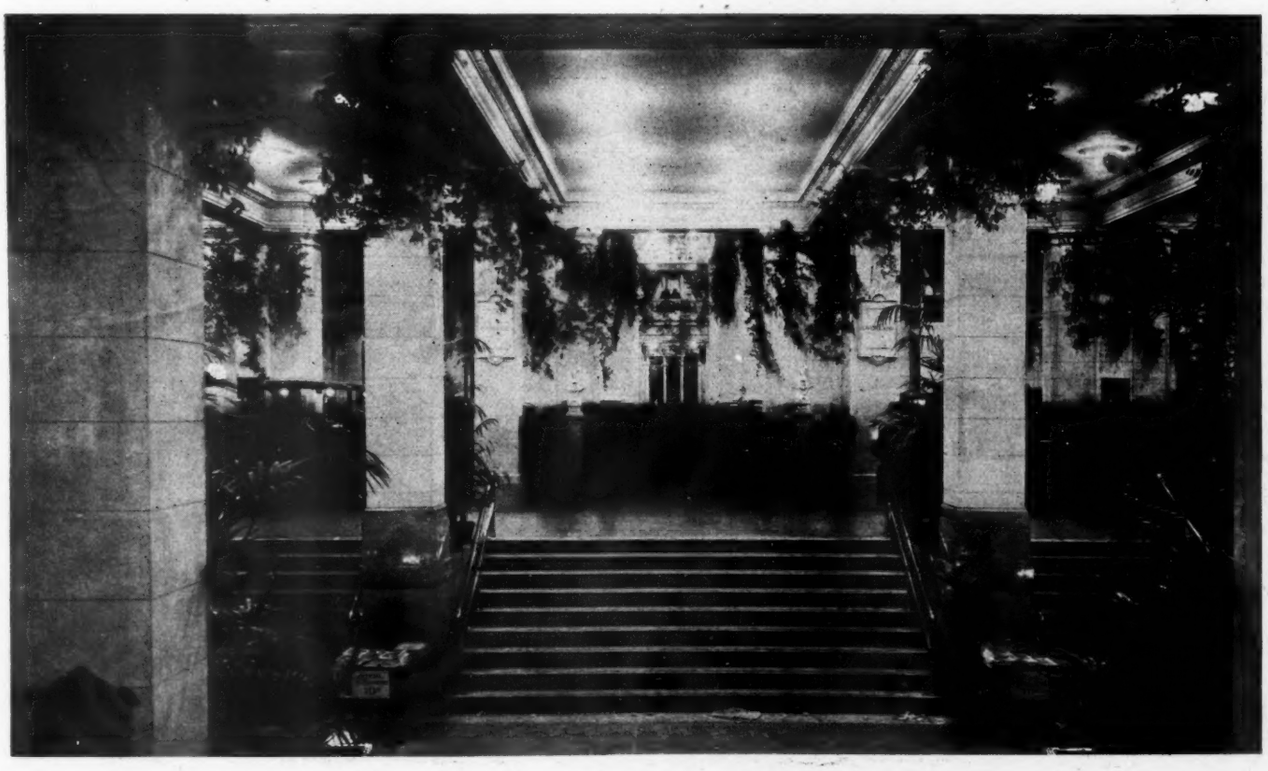


New Apperson block six-cylinder motor with intake and exhaust valves on one side. Note valve cover plates incorporating breather mechanisms, also intake manifold and exhaust manifold attachment together with order of cylinder firing, namely, 1, 5, 3, 6, 2, 4 on the intake manifold

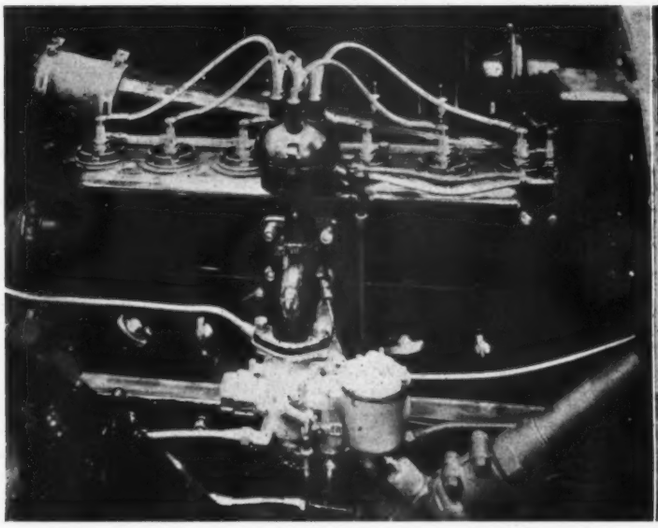
of elegance in the exhibits. Overland is showing a closed car for the first time—a coupé of pleasing lines and interior finishings. Among the specially finished exhibits are the Packard landau, Pierce brougham, Velie touring car finished in white, Abbott in green, Paige in green with gold stripes, White berline, Stearns-Holbrook limousine, Lozier's canary yellow roadster and touring car, Premier's Weidley-engined runabout, National's new six coupé, Maxwell 25 landaulet, Jeffery sedan, Cole roadster finished in white, Cadillac sedan, Briscoe little tourist in white, Lyons-Knight sedan, Keeton convertible roadster, Stevens-Duryea limousine, Baker electric in white and gold, Fiat limousine and roadster, Pathfinder sedan and cruiser, Oldsmobile victoria and Marion, showing closed cars and sixes for the first time.

The cyclecar has been presented to the anticipating public, at least some cyclecars have been presented, while others prefer and some insist that you use the term light car. Among this smaller set are Saxon, Briscoe, Car-Nation, La Vigne, Cornelian, Twombly, American and Imp. Many would like to have seen more of these juveniles, and it is to be hoped that next year will see a good fraction of an entire floor given over to these newcomers. As next week's issue will contain much special information on cyclecars, these are passed over this week, excepting for some information on a few of them under the title Late Arrivals at the Show in another part of this issue.

There are too few polished and well-painted chassis in the exhibit spaces this year. To be exact, there are but thirty-seven chassis on exhibition out of eighty-two different makes of cars at the show. This is far too few, particularly when you note that the real working parts of the cars have today more attractions



Main entrance to Grand Central Palace shows simple decoration scheme consisting of evergreens around the top of pillars and ferns scattered along the aisles



Valve side of the block Chalmers small six motor shown for the first time. This is without a magneto and the Atwater-Kent ignition system is on the top of a vertical shaft driven from the camshaft and passing through the intake manifold. To the right is a cross aisle on the second floor

for the visitor than the finely finished body exterior or the luxurious interiors. Among those exhibiting chassis are Overland, Cadillac, Hudson, Hupmobile, Packard, Pierce, Reo, Kissel, Locomobile, Premier, Maxwell, Jeffery, Cole, Buick, Mitchell, Cameron, Allen, Ohio, Partin-Palmer, Briscoe, Chandler, Metz, King, Palmer & Singer, Metropol, Vulcan, Case, Moon, Willys-Knight, Ward, Cartercar, Fiat, Great Western, Speedwell, Stutz, Mercer, Chalmers and Detroiter.

There are several concerns not exhibiting chassis who show instead working power plants, many of which are cut away showing the internal working parts.

Electric Clans on Hand

The exhibit of electric passenger cars is much better than at any previous New York show, and having them all grouped on the second floor gives the impression of a show within a show. Unfortunately there are several names of electric makers not included, but those present are among the oldest as well as the youngest makers in the field. Those present include Ohio, Rauch & Lang, Waverley, Baker and Ward, the last mentioned exhibiting passenger vehicles for the first time. The electrics are all attractive with palatial bodies, and when it comes to compact seat arrangements and deftness in arranging body details, the electric makers carry off the palm.

There are many innovations, novelties, you may call them, at the show, some coming under the car classification and others under the accessory spotlight. One of the leaders is the Entz electric transmission, which, although not new to many of THE AUTOMOBILE readers, comes forward as a tried-out practical device which has been on the road test for 20,000 miles and has given entire satisfaction. This electric system takes the place of the clutch, the change-speed gearset, the electric starter and the electric generator. This device is exhibited in an Austrian-Daimler chassis in the Palace and a demonstrating car is used outside.

One of the aisles in Grand Central Palace, showing exhibits and scheme of decoration. The square posts with figure on top are used between adjacent exhibit spaces

The New Show Crop

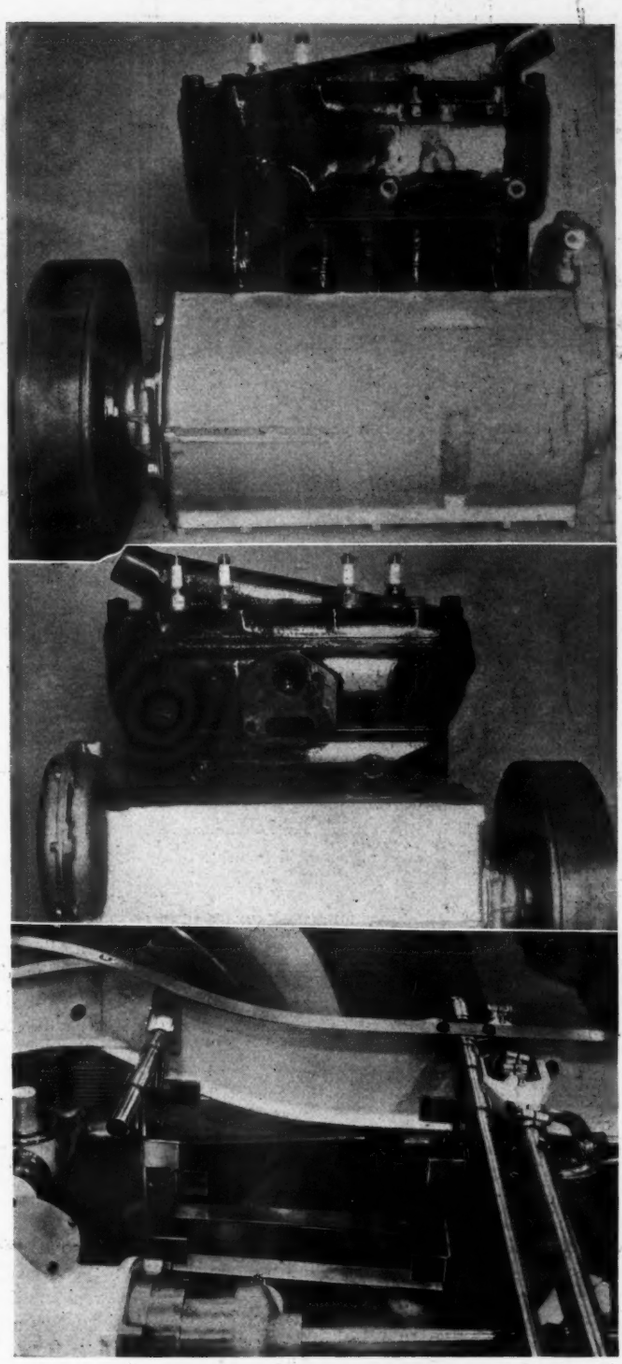
There are a few new cars on hand, many of which were held back by the makers in order to jump into the limelight with them at the show opening. Packard shows for the first time its just-announced 4-48, a new big six with L-head cylinders cast in blocks of three. The entire motor is fashioned not a little after the present 2-38 Packard model. The much-heralded Premier-Weidley chassis using the new Weidley valve-in-the-head motor is shown in chassis and runabout form and is attracting general attention. The chassis is one of the cleanest-cut jobs of the season.

Chalmers has been holding off on the announcement of its little six with block motor, thermo-syphon cooling and a new ignition system. Benja-

min Briscoe is on hand with his new light car which he has developed in Paris during the past season, but the cyclecar which he also developed is not on hand.

The new Moline-Knight sleeve-valve motor is on hand, and is receiving the lion's share of attention because in the booth are the sealed parts of the Moline-Knight motor which finished, the day before the show opened, its 336-hour endurance test at the Automobile Club of America laboratories.

But the enumeration of new cars can go much further. National has broken, one should say re-broken, into the six-cylinder field and shows for the first time its new small six, with block cylinder casting, 1-head design and with cantilever rear springs, used by this company for the first time. Then, too, the new light Hudson six which artistocratically made its debut at the recent Paris Salon is on hand. In another part of the Palace is the Willys-Knight, a car brought out a year ago under the name of Edwards-Knight but recently acquired by the Willys interests. Then there is the new Cameron, the first water-cooled motor to be shown by this company. The Fischer-Magic motor is exploited in a special car built for show purposes. Lozier has its new cleancut four-cylinder design which it brought out a month ago, and which marks a reversion to the four-cylinder field, this company a year ago having pinned all of its faith in sixes. Pathfinder has a new Daniel Boone four-cylinder model. The new Buick six is on hand. On hand, too, are a score of other makers who have new models, all of which have been described in detail in these pages during the past autumn and winter. Last but not least is the Lyons-Knight, a newcomer using the sleeve-valve motor. It is shown in four-cylinder design only.



Left—Effective mud apron on Packard battleship gray, which is new with this concern. Right—Showing how Premier runabout with Weidley motor is rear-deck designed to accommodate spare wire wheel. It will be noted that space is provided for the carrying of various tools, inner tubes and other things of this character

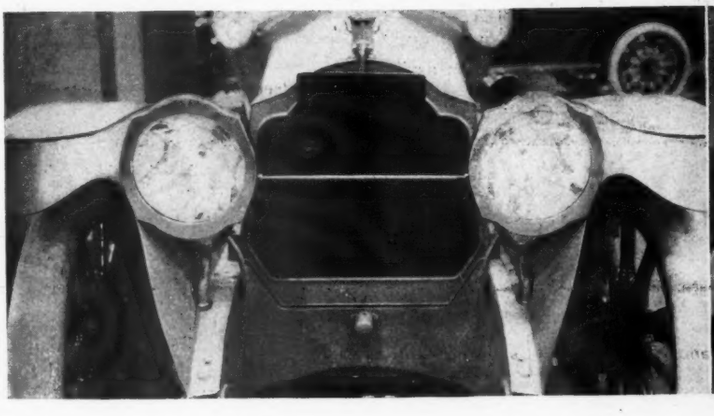
Sensations in Accessories

Turning next to the accessories there are real sensations, semi-sensations and conventional announcements. The new Hartford electric brake is receiving much attention. Electric starters are not the magnets they were a year ago but are nevertheless much in evidence, largely because their manufacturers prefer to display them mounted on a motor so they can be demonstrated. Some are quite noisy, making their presence known.

The carbureter people are on hand but not in very great numbers. The big leaders are here. Along with them are several new faces, the Master

At top—Valve side of block motor in Chalmers small six, showing large water inlet opening for thermo-syphon system, and also large outlet water pipe in center—Showing intake and exhaust openings in new block motor of Saxon car

At bottom—Well planned and light steel battery support on Locomobile chassis



Effective scheme of mural decorations surrounding the Court of Honor on the main floor, this view looking towards the main entrance

coming from the Pacific coast. Nearly every maker has a new model and not a few improvements in the older models. Many are working on types with no moving parts, many are attaching better dash controls for the fuel and air valves and all are trying to convince the visitor that the new models are more economical, in fact, the carbureter maker is aiming at greater fuel economy.

Many Speedometers

Speedometers are well represented, many concerns having new types that sell at $10 or $15 under the 1913 models. The magneto people are not on hand, some of the best-known names being missing from the show programs. The tire people agreed to stay out of the show and have pretty well succeeded, although there are half a dozen makes on hand.

The non-poppet motors are in greater evidence than a year ago. The followers of Knight have increased and comprise Stearns, Willys, Moline, and Lyons, the names of Columbia and Stoddard associated with this motor a year ago having dropped out due to the vicissitudes of the United States Motors. Speedwell shows its Mead rotary valve as it did a year ago. The Fischer-Magic motor which was announced a year ago is seen on a Palmer & Singer chassis. The Carter piston-valve motor is shown on a stand in the Great Western exhibit and in one of the cars.

A walk through the show convinces the visitor that wire wheels are coming more and more into vogue. The show cars are generally fitted with them and many other cars carry them. They are found on one or more models of the following makes: Abbott, Kissel, Paige, Stearns, Premier, Krit, Chalmers, Cole, Twombly, Fischer, Briscoe, Haynes, Stevens-Duryea, Willys-Knight, Fiat, Moline-Knight, Pathfinder, Stutz and Oldsmobile.

Facilities for the carrying of spare wire wheels have been made a part of the design of many of

the cars at the Palace which are so equipped. Rigid and quick attachment of these spares is obviously necessary and the use of straps has been somewhat frowned upon. These are often hard to undo and do not make for very rigid fastening. So the dummy hub fastening to a strong arm which in turn is riveted to the frame has come. This hub provides for the attachment of the spare in the same way as it is fixed to one of the live wheels.

Speedometer drive also has its innings this year. Besides the several examples of inclosed drive within one of the front wheel spindles, there are several instances of the actuation of the speed indicator from the transmission shaft. Among those having enclosed drive are Cadillac, Hudson, Chalmers, Lozier.

It is hard to say whether or not the V-shaped and the rounded front radiator have added any to their numbers. The V-type is very popular and goes very well with the sloping hood and rounded cowl effects of the day. Oaklands are all of the V-radiator type this year, though in the new sixes, the top of this has been modified and given a curvature nearer to that of a semi-circle than formerly. Paige unexpectedly brought to the Palace a very attractive roadster with a pointed radiator, while another very good example of it is the Austrian-Daimler which is on hand with the Entz system of electric transmission as its feature.

Radiators Are Attractive

Jacksons are of the rounded front type, while the new Cameron has a pointed effect. The rounding over of the front edges of the radiator is also very prominent this year and is certainly a touch, though really small in itself, which is in accord with smooth lines and general attractiveness of the whole. Such coping over of the edges is seen on the Hudsons, on the new Krits, the Oaklands, Wintons, Peerless and many others. The latter two have always adhered to

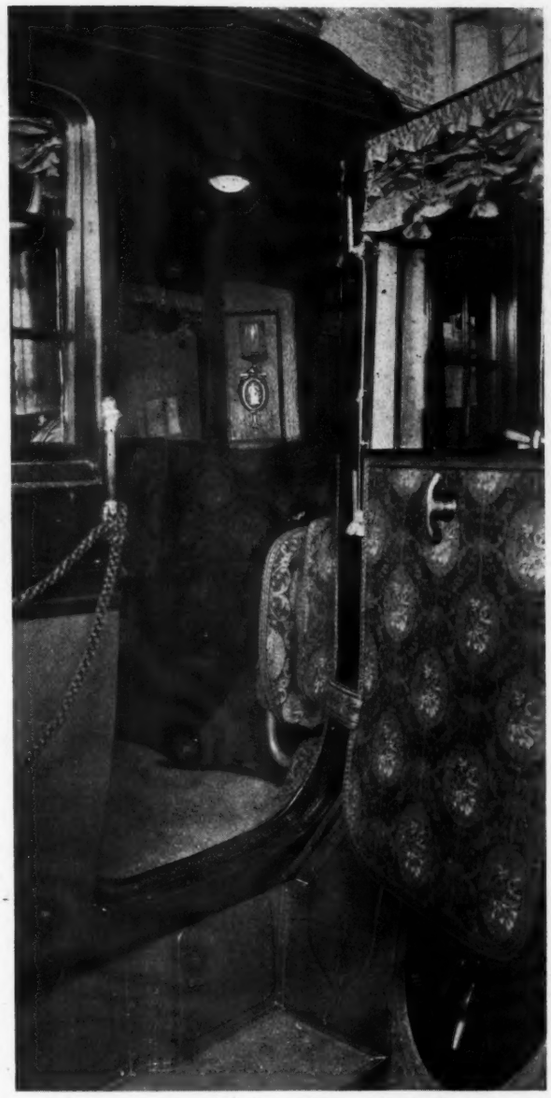
this point in radiator design. The latest Briggs-Detroiter car also has an attractive radiator, which has a bulge part at the top.

Instrument Boards Attractive

Body designers have undoubtedly given much thought to the arrangement and looks of the cowl instrument board, now included in nearly every car. They are symmetrical affairs with the gauges and other instruments set into them flush with the surface. A large amount of this good looks reflects upon the concerns who have made these instruments. They are finished with a high nickel polish, have attractive, readable dials and bevel glass crystals. The boards themselves are either of highly polished wood in natural finish, or they are leather lined to match the upholstery of the car. But there seems to be a greater proportion of the natural wood instrument boards than of the leather covered ones.

The grouping of the most important instruments with a dash lamp directly above is well thought of and cannot help but be appreciated by the motorist—especially the one who drives at night. He can look in one place and see all his gauges, know the time, and the speed. This grouping usually occurs in the center of the cowl board, and several instances of utilizing the free space at the sides by small cabinets provided with locks are to be found. Such cabinets make convenient and safe receptacles for countless articles, such as driving gloves, goggles, caps, tire gauges, cigar lighters.

One very simple and attractive instrument board design is that of the White. On the special panel in the center is placed the electric indicator showing whether or not the storage battery is being charged or is dicharging, while on one side of it is the starter switch and on the other the switch for working the electric light combinations.



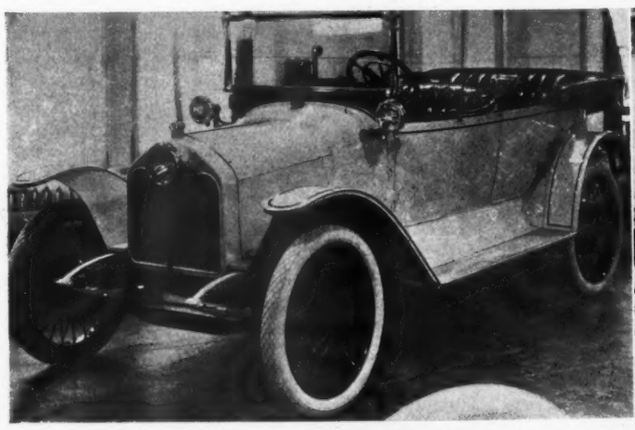
Interior of Locomobile Longchamps limousine with its palatial interior in gorgeous tapestry effects with pillows for cushions. This is a show car of distinction and has every conceivable feature and fixture for the comfort of the passengers. It is really a miniature drawing room. In the rear corners over the seat are very elaborate tiny chandeliers set in wood paneled recesss. These have shaded lights, and below there are cameos which give a new conception of limousine ornamentation. The side walls and ceiling are finished in dark paneled walnut

Lanchester Spring Popular

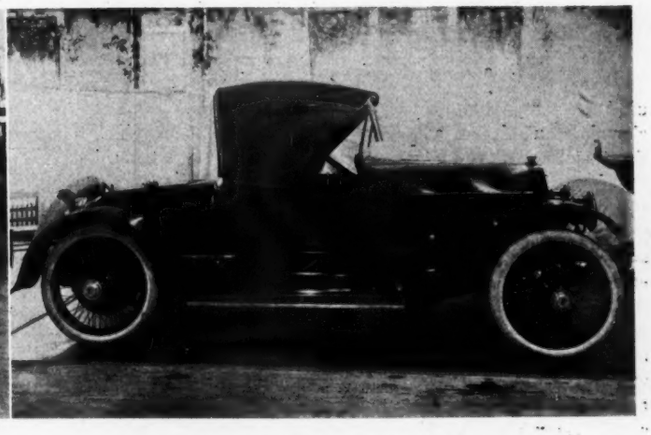
The Lanchester type of springing this year has three adherents besides the King, which has always featured it. These are National, Willys-Knight and Pathfinder on its newest car. With two of these —the National and Pathfinder—it is a brand new design, the Willys-Knight, which is a continuation of the Edwards-Knight, having this springing from the first. The principal variation in these designs is in the center trunnion mounting. All are outside of the frame. In the light car field at the Palace, the Saxon and Car-Nation have a modified cantilever adaptable to their lighter constructions, while the Twombly cyclecar is also so hung.

Attendance so far this year is considerably ahead of last. For the first three days of the exhibition, it is estimated by those in touch with this part of the affair that it has run 25 per cent. ahead of the corresponding 3 days of the combined Palace and Garden shows of 1913. This is particularly gratifying as indicating that the interest in the National gathering of motor cars and accessories is not abating.

From 2 to 6 p. m. Tuesday, about 18,000 persons had passed the ticket takers, while on the opening day a count from the time of throwing back the doors at 2 p. m., until 5.30 p. m., showed that 8,200 admissions had been paid for. The first day is always the great complimentary ticket day and about one-third of those on hand paid to get in. Saturday's afternoon crowd totaled, then, about 24,000. These figures are considerably ahead of corresponding periods of last year's combination.



The Briscoe small car



Attractive Fiat roadster in red

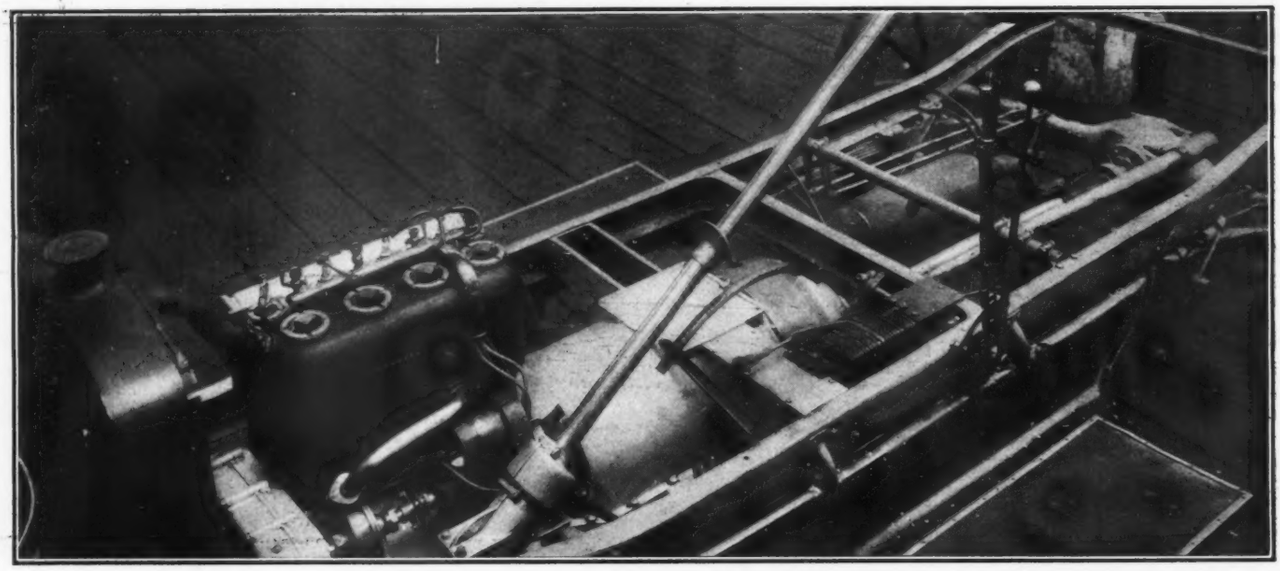


Fig. 1—Chassis with Entz electric transmission system. Immediately in rear of the gasoline engine is the clutch-generator, which rotates with the crankshaft and is entirely enclosed. Immediately in rear of this is a supporting cross member, and in rear of this comes the boosting electric motor, which helps the gasoline engine to drive the propeller shaft

Electric Transmission Makes Début

R. M. Owen Exhibits Entz System which Displaces Clutch, Gearset, Starter and Generator, and Gives Simple Control—No Battery Needed—Uses Boosting Electric Motor and Magnetic Clutch—Is Self-Contained Unit

ONE of the most interesting exhibits at the Grand Central Palace is the Entz electric transmission system installed in an Austrian Daimler chassis, the exhibit being made by R. M. Owen & Co., New York City, who have secured the Entz patents covering this system of transmission. The Owen company expects to manufacture a series of cars fitted with this electric transmission and also to make arrangements with automobile builders to use the Entz system on a royalty or other basis.

This electric transmission takes the place of the flywheel clutch, the change-speed gearset, the electric-starting motor and the electric generator and is a complete unit located immediately in the rear of the gasoline motor and connected with it at one end and with the propeller shaft which connects with the rear axle at the other end.

The most interesting feature of this electric transmission is that it does not require a large storage battery; in fact, the transmission does not require a battery at all. The chassis is, however, fitted with a small 35-ampere starter battery which is used to carry the electric lights and is drawn upon by this electric transmission when it is used to start the engine. Once the gasoline motor is running the Entz transmission has no use for a battery and is entirely independent of even the small starter battery except when charging same on direct drive.

The Entz electric transmission system weighs practically the same as the present gearbox with flywheel, clutch, starter, generator, and the other parts which it displaces, so that it enters the field without a handicap. From a standpoint of price there is no reason why this electrical transmission system will cost more than $25 or $30 more than the equipment it displaces, and when it is manufactured on a production basis the same as regular parts of the car there is a possibility that it will be considerably cheaper than the present equipment.

In driving a car with this electric transmission the speed of the gasoline motor is controlled identically as when driving with a friction clutch and gearset. The throttle is used continuously and the speed of the gasoline motor maintained within its range of efficiency the same as is done with a conventional clutch and gearset.

As Fig. 1 shows, this electric transmission system is a two-unit one, both being barrel-shaped, the forward one forming the flywheel of the gasoline engine and the rear one being a separate electric motor on the propeller shaft. Fig. 3 shows a section of this system, showing the crankshaft, to which is attached what is designated the clutch-generator, which has its field part F.R., which carries the field winding F. W. and the pole pieces P.P. This field portion of the clutch-generator rotates whenever the crankshaft rotates. Within it is the armature A secured to the shaft S, which shaft is continued rearward through a coupling K into another shaft S, and this in turn connects through a universal joint at X with the propeller shaft at the rear axle.

The second part of this electrical unit is shown in the right end of the illustration, and in all respects is a duplicate of the clutch generator shown at the left. This electric motor has an armature A1 carried on the shaft S, so that both the armature A and A1 are on the same shaft. Outside of the armature A1 is the usual field part of the motor comprising the field rings F.R., field windings F.W., pole pieces P.P. and the usual brushes, B.

To understand the workings of this electric transmission the reader must bear in mind that the field part F.P. of the clutch generator is entirely separate from the armature A, there being an air gap between them, the same as in all electric generators and motors. This clutch-generator, however, is the clutch in this electric system and drives through air instead of by actual contact, as is the case with a cone clutch or a multiple-disk one. Thus the field F.R. may revolve and the armature A, on its

shaft S, remain stationary. Then, too, the field F.P. may revolve at a speed of 1,500 r.p.m. and the armature A at a speed of 100 r.p.m., which would give a reduction for low speeds. It is by varying the relative speed of the field F.R. and the armature A that speed changes are accomplished.

It is when looking at the electric motor at the right of Fig. 3 that another interesting aspect of the Entz electric system is discovered. This motor may be called a boosting motor, in that it helps to rotate the propeller shaft, lending assistance to the gasoline engine. The way this is done is explained later.

The manner in which this Entz electrical system works out is as follows: Take its operation on direct drive, which is simplest. The clutch-generator is short-circuited on itself and rotates the armature A with it. There is, however, a slight slippage between the field F.R. and the armature A, in that if the motor were working at 1,000 r.p.m. the armature would be turning the propeller shaft to the rear axle at approximately 960 r.p.m. In other words, there would be a loss of 40 r.p.m. per 1,000 with the car running on a level road. If the car were mounting a heavy hill where the engine would have to pull more, the slippage would slightly increase.

On all of the other forward speeds, and there are seven others, the change in speed is accomplished by making this slippage between the field and its armature more, thus on low speed the field may be revolving 1,000 r.p.m. and the armature within it 250, or perhaps 100 r.p.m. On the other speeds the amount of slippage is according to the requirements.

The changing of speeds in this electrical system is controlled entirely from a small lever on the steering wheel, which lever is very little larger than that for controlling the spark or throttle. This lever works on the right side of the wheel and has a neutral position and a series of other positions for the different speeds. This lever is also used for starting the engine, it only being necessary to move the lever upward to the starter position. When changing from one speed to another this lever is moved a little more than an inch, and in changing speeds there are no mechanical jumps as in our sliding gearsets of today, but one speed gradually works into another imperceptibly.

Let us look further at this slippage between clutch generator. On the face of it everyone will immediately say that this slippage represents an enormous loss of power between the motor and rear wheels, and consequently the system is a most inefficient one. This would be the case were the slippage not made use of, but this slippage is converted into electric current, and this electric current is in turn used to drive the electric motor on the propeller shaft, which helps the gasoline engine to propel the car. There is nothing new in this movement, in that the clutch generator is practically the same as a generator in an electric power plant in which the armature is rotated rapidly and the outside or field part held stationary. In this case it is all slippage between the armature and the field part, and this generates the electricity which we use to light our homes, drive our street cars, or heat our apartments. In the Entz system the clutch generator A has neither the external

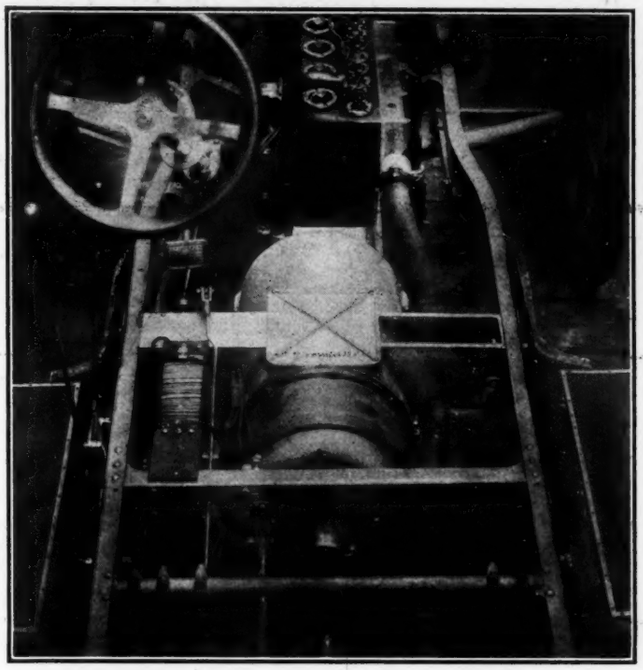


Fig. 2—Rear view of Entz electric transmission, showing resistances at the left of the boosting motor on the propeller shaft

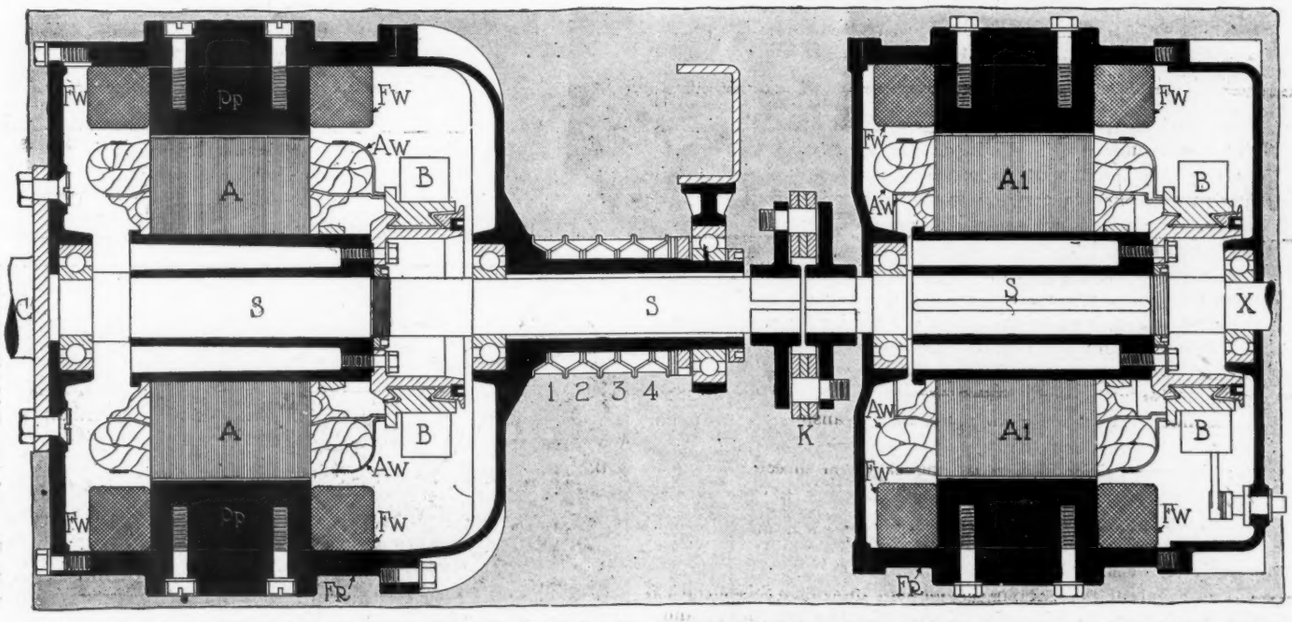


Fig. 3—Vertical section through Entz electric system. To the left is the clutch-generator, the outside portion FR of which rotates with the crankshaft C, whereas the center or armature part A is entirely separate. At the right end is the boosting electric motor with its armature A1 on the same shaft as the armature A of the clutch-generator. The field FR of this boosting motor is always stationary. X shows where the universal joint couples with the propeller shaft

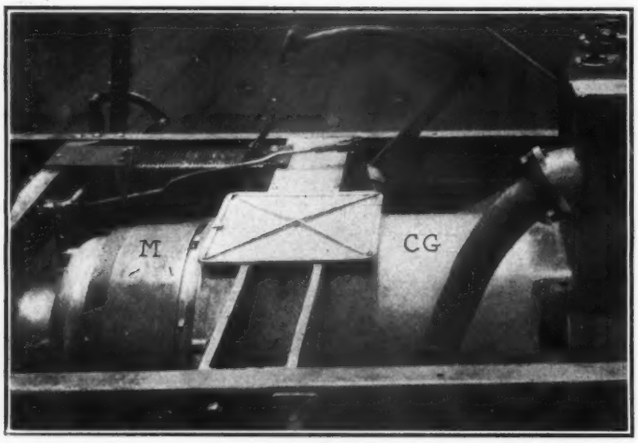


Fig. 4—Near-hand view of the Entz electric transmission, showing the clutch-generator housing CG and the boosting electric motor M on the propeller shaft

field part or the armature stationary, but both revolve, and at different speeds. The outside or field part always rotates at the crankshaft speed of the gasoline engine, whereas the armature rotates according to the speed controller which determines the speed at which you wish to travel. It will be seen that this generation of electric current by slippage in the clutch generator is nothing new.

Next comes the method in which Entz takes this electric current generated by slippage, and uses it to assist the gasoline motor in driving the rear wheels. This motor has a stationary field F.R., and when the current from the clutch generator is used in this electric motor, which has an armature, A1, on the shaft, that carries the armature for the part A, it, according to the principle of any electric motor, aids in rotating the armature, and as the armature is connected with the propeller shaft it lends its force in rotating the propeller shaft in the same way that a man can assist a motor car out of a sandy place, or out of a mud-hole by pushing on one of the driving wheels.

Action of the Boosting Motor

It is through the small controller handle on the steering wheel that this work of assisting by the boosting motor is accomplished. The electrical system is such that the boosting motor does not assist on direct drive, at which time it is positively idle, and any slippage occurring in such generator produces an electric current which is used to overcome the internal resistance of the clutch generator itself. As soon, however, as you get into the intermediate speeds the wiring system is so devised that the current generated is used on this assisting or boosting electric motor. On second and third intermediate speeds the electric current generated by the slippage is used to drive the boosting motor, thus giving high pulling power on what is ordinarily known as low and second speeds. When you get to third speed the current generated by the slip is utilized by the electric motor, but by weakening the field of the motor its pulling power is reduced and the slippage of the generator reduced, giving higher speed. This utilization of the current is affected by the controller, which weakens the field current in the boosting motor and so reduces its assisting power as the speeds increase. When you change into the higher intermediate speeds there is a correspondingly less use of the boosting power of the electric motor, but even here there is not a waste because on these speeds there is less slippage in the clutch generator, and consequently less electric energy generated.

It is apparent then, from the method in which this electrical transmission works, that the slippage in the clutch generator which corresponds with the flywheel clutch in our cars of today is not in reality a loss at all, but rather a flexibility of drive, and which flexibility is made to add to the driving power of the car. If the Entz transmission system were an untried system this theory might be questioned, but cars of this system have been driven 20,000 miles during the past season and in not a single instance have they failed. That the slippage spoken of does not result in loss of power is proven by the fact that the gasoline consumption with this system is no higher than with the flywheel clutch and present-day gearset system. If the electric system were not efficient and if the slippage did result in a loss of power then the car would not travel as far on a gallon of gasoline as it would on the clutch system, which is disproven by continued testing. In a word, the slippage means a reduction in speed, but with an increase in torque, which represents the propelling factor of a motor car engine.

The mechanical equivalent of such a system would be that of a clutch for transmitting the torque of the engine and which could be slipped while still transmitting torque, but in which the slippage instead of being lost energy or power in the form of heat as in a friction clutch as used today on cars, would generate useful energy like electrical energy as in the case of the electric transmission, and this electric energy be utilized in a motor adapted to help to drive the propeller shaft.

On direct drive the efficiency of this system ranges from 96 to 93 per cent., the loss being only the slippage loss in the clutch generator, which, however, is a positive advantage in increasing the pulling power of the gasoline engine on all speeds of it below that at which it gives maximum torque.

This electric transmission system is in no way different from an electric dynamometer used in testing laboratories excepting in that the field in the dynamometer is practically stationary except for the small fraction of rotation, whereas in the clutch generator of the electric transmission the field rotates at the speed of the gasoline engine and the armature rotates at whatever speed your controller is set for, but in each case the full torque is transmitted to the other movable member which is not connected to the gasoline engine and in this case is the armature, which is coupled direct to the propeller shaft coupling with the axle.

This Entz system, although new, in its present perfected form on the automobile, is not new, for it was conceived as far back as 1898 and actually used in cars as far back as 1903. Since then it has been constantly worked upon and refined until produced in its present form.

The electric boosting motor M, Fig. 4, performs some subsidiary functions in addition to that of assisting the gasoline engine to do its work. This motor serves as an electric brake and gradually reduces the speed of the car when the controller handle is placed in a neutral position. This motor also charges the storage battery at a 10 ampere-hour rate when the direct drive is used. Should additional battery charging be needed there is a still further position of the controller handle which gives a charging rate of 30 amperes, which is useful after the car has been idle for some time or in emergency.

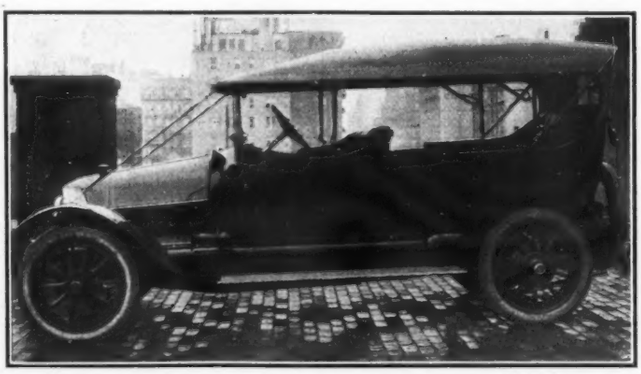


Fig. 5—Austrian-Daimler chassis fitted with Entz electric transmission system and used for demonstrating at the Grand Central Palace show

Late Arrivals at the Palace Show

Packard Big Six with L-Cylinders—Chalmers Announces New Small Six—Apperson Brings out Block Six—New Briscoe Car and Others

IT has come to be a custom to expect to see several new cars or new models at the annual New York show of which the public has known little or nothing. Some of the older manufacturers take delight in reserving a new model to spring as a sensation and those that make their début take that occasion to leap into popular notice. Motorists who are looking for sensations need not be disappointed this year for there are several among the exhibits at the Grand Central Palace.

Packard Adds Big Six

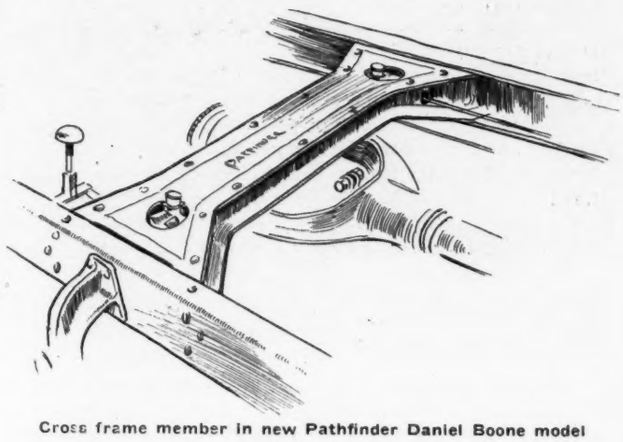
Packard has taken occasion to give the first public airing to its latest model the 4-48. In spite of its model name the new car is a six-cylinder creation, the 4 part of the name meaning that it is Packard's fourth 48. The rest of the model name comes from the S. A. E. rating, 48.6 horsepower. On the whole the car is the same as the recent 2-38 except for slightly larger dimensions, this taking concrete shape in the cylinder dimensions, 4.5 by 5 1-2 inches and the wheelbase, 144 inches.

Like the 2-38 it has the L-head motor with cylinders cast in threes, the worm-bevel rear axle and the centralized control on the steering wheel at the left. Bosch duplex ignition is used. The motor has pressure feed to thirty-five points including the cylinders. Eighteen different bodies are fitted to the 4-48 chassis. Touring cars have the one-man type of top with no bows in front of the rear seat. Tires are 37 by 5.

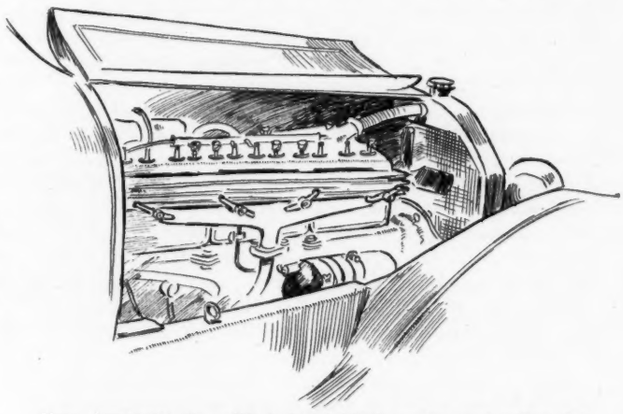
Chalmers Brings Out Small Six

Chalmers unveils its new light six as a five-passenger tourist selling at $1,800. It is called the six-48 and bears the model number of 26, being a smaller brother of the older model 24. The reason for its appearance was to produce a car to meet the demand for sixes of low initial cost and maximum economy. The motor has T-head cylinders cast in block of 3 1-2 inches bore and 5 1-2 inches stroke. It is stated that extensive dynamometer tests show 54 horsepower in continuous running, the unusual power probably being due among other things to the extra large valves made possible by the T-head construction. The gas is triple heated on its way to the cylinder, by hot air, hot-water jackets about the carbureter and by the water-jacketed intake manifold. Valves are tungsten steel, motor lubricated by combination force feed and splash. Water circulation is an improved thermal system—a departure from previous Chalmers practice in which a pump has figured.

Motor equipment includes a Rayfield carbureter and the Chalmers-Entz lighting and starting system, the feature of which is the fact that the starter is always connected with the motor and keeps the latter running under all circumstances, except when shut off at the will of the driver. It is said to be impossible for the motor to stop, even should the gas be shut off accidentally, and the starter helps the engine pick up after changing gears. This makes the motor unstallable, according to Chalmers engineers. Another feature of the motor equipment is the ignition system, no magneto being used, an Atwater Kent distributer mounted on the intake pipe handling the battery current for sparking.



Cross frame member in new Pathfinder Daniel Boone model



New Apperson six with L-head block motor and yokes for attaching manifolds

The clutch is a disk type with cork inserts similar to that of the model 24. The gearset gives three speeds and is operated by a central lever, the gears being interlocking at all speeds. The axle is the floating type, rear springs are three-quarter elliptic underslung. The wheelbase is 126 inches and tires are 34 by 4 inches. Steering is on the left and there is a primer on the dash to the manifold for starting as well as a dash carbureter adjustment.

As to bodies, the car has a long sloping cowl in which the fuel tank is carried, tapered bonnet and bell-backed tonneau. The tank portion of the honeycomb radiator is rounded as are the fenders. Running boards, of course, are free from encumbrances. In addition to the touring car there is a convertible coupé-roadster called a coupélet.

The car is really light for a six, the weight given by the factory being 68 pounds per horsepower. This makes for economy, and repeated tests by the Chalmers engineering department has shown 20 miles per gallon of gasoline, made by an experienced driver after the car was well warmed up to a point where carburetion was good.

Willys-Knight—A New Name

The new Willys-Knight appears as a four-cylinder, Knight-engined car with 4 by 5 1-2-inch cylinder dimensions. Aside from its power producer the car has a number of unusual features, underneath—the worm driven rear axle and the Lan-

chester type of cantilever spring suspension, all of which were features of its prototype of last year, the Edwards-Knight, which it supersedes. It has a four-speed gearset with direct on third speed and between the cone clutch and the gearset is a leather universal. From the worm ended propeller shaft the drive is taken by a floating axle. Fuel is fed to the Stromberg carbureter by pressure. The other equipment includes a Simms magneto, U. S. L. lighting and cranking system, 36 by 4 1-2-inch tires on wire wheels, an extra wheel being supplied. Left drive and center control with ball-type lever is stock, as are a one-man type of top with a one-piece windshield, the feature of which is that there is no molding at the top, the rounded edge of the glass forming the upper edge. The speedometer is driven from the universal. The wheelbase is 120 inches and two bodies are offered, a two-passenger roadster and a five-passenger touring car, both at $2,750. Body lines are smooth and running boards are clean, the tool boxes being carried under them. Very neat ventilators are provided in the dash. A little thing which shows thoughtfulness on the part of the designer is a foot rest in front of the accelerator pedal.

Briscoe's Small Car

American eyes have their first opportunity to view Benjamin B. Briscoe's new car at the Palace. This is now being manufactured in Europe and deliveries from the American factory are promised in April. There are two cars in the line, a light five-passenger model at $900 complete with electric cranking and lighting which is in no sense a cyclecar, and a four-cylinder cyclecar which has not appeared as yet on this side of the water.

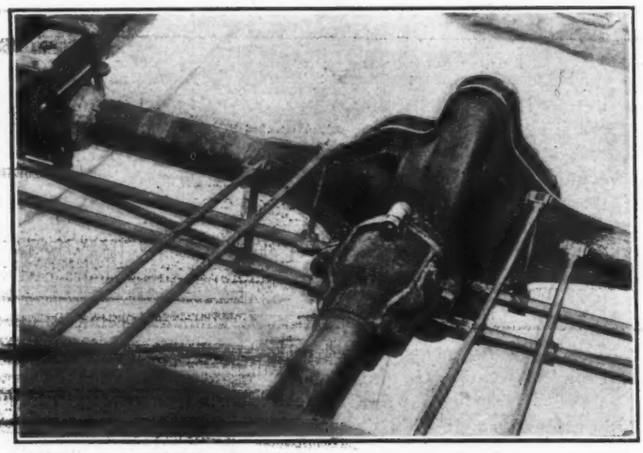
While the prevailing idea in the design of the big car is American, inspiration has been taken from the European school and European experts have had a hand in the design. The new Briscoe has a unit power plant, three-point suspended, the four-cylinder block motor having cylinders of the L type 3 1-5 by 5 1-8 inches. Cylinders and crankchamber form a single casting, the bottom part being a pressed steel oil pan screwed into position. This implies a two-bearing crankshaft, whose diameter is 1 7-8 inches. The carbureter is a European model and the ignition and lighting are Westinghouse. The cooling is thermo-syphon with a propeller-type fan.

The flywheel contains the leather-faced cone clutch and a very compact three-speed gearbox is carried by crankcase arms. Control is center and steering is optional, the steering wheel location being susceptible of easy change if desired. One side of the gearbox is detachable so that a lighting and starting generator may be driven from the gearset. Final drive is by propeller shaft to the floating axle. Springing is by long semi-elliptic springs front and rear. The wheelbase is 105 inches, tires are 30 by 3 1-2 inches and the tread is standard. The chassis weighs 980 pounds and the complete car weighs 1,700.

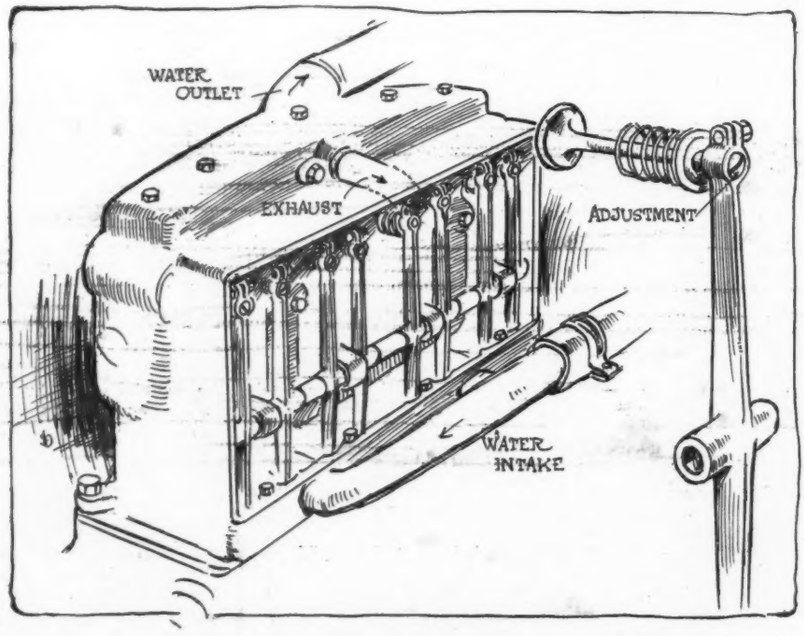
European style is followed closely in the body. There is not a break in the smooth lines from the radiator to the back of the tonneau. The tank is placed under the scuttle dash and the single headlight is incorporated in the center of the upper portion of the radiator. The latter is made of aluminum. Electric lights are fed from a storage battery in the Stock model, which lists at $750, the equipment including horn, battery, demountable rims and tools. When fitted with the lighting generator and electric cranker, top and windshield, the price is $900.

New Pathfinder Model

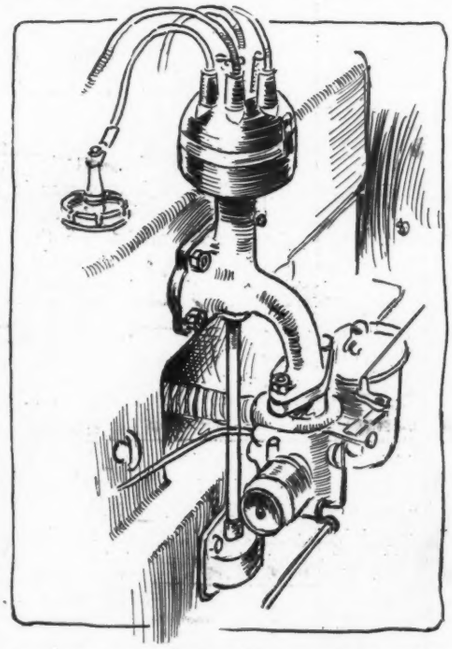
Pathfinder's latest model called the Daniel Boone is a light six with a Pathfinder-Continental motor of 3.75 by 5.25 cylinder dimensions. Its chief departure from former products of this



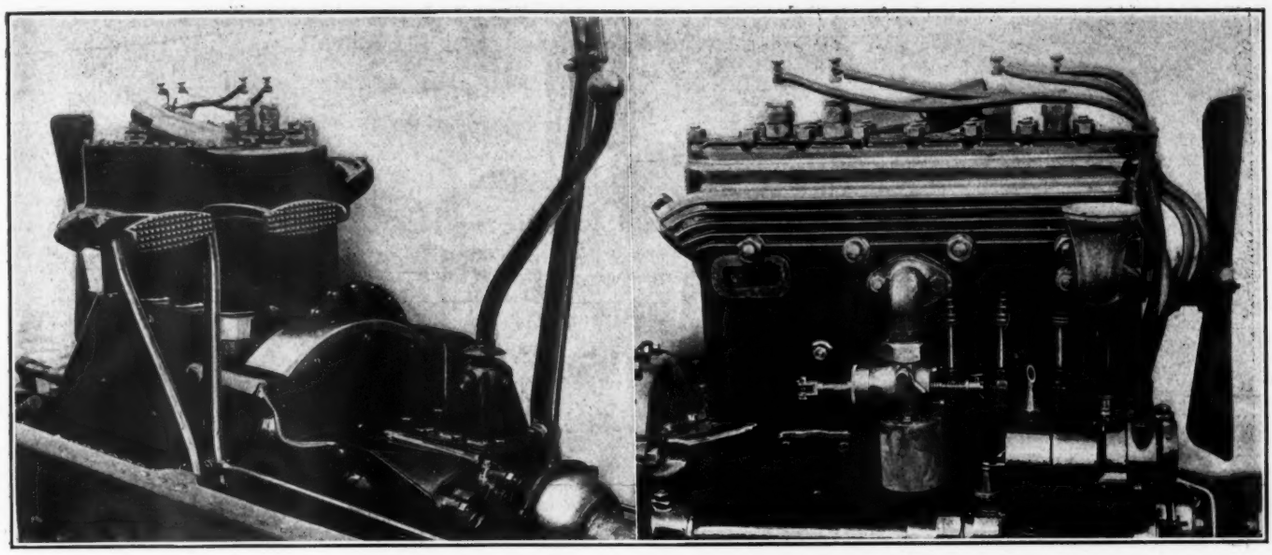
Rear axle and brake connections on Briscoe light car



Valve action on new Cameron water-cooled car, which valve action has been used for many years by the Cameron company



Mounting of Atwater-Kent ignition device on Chalmers small six



Two views of the four-cylinder block motor on the Briscoe small car with cylinders 3 1-5 by 5 1-8 bore and stroke

factory is in the rear suspension which is of the cantilever type and is particularly substantial. A very easy-riding car has been obtained with this design, a ride on one of the experimental models at the Hoosier factory over some very bad roads showing unexpected freedom from bumps. Another of the features of the new model is the box type of middle cross member of the frame in which the brake shafts are carried with grease cups projecting through for lubrication. The special Pathfinder yoke and torsion tube assembly carries the drive to the floating axle. A four-speed gearset is used with direct on third. Wheels are 34 by 4 1-2 inches. This, like the other six, has a pointed radiator. It sells at $2,275 as a touring car for seven and at $2,222 as a five or two.

Car-Nation Has Cantilever Springs

The Car-Nation, one of the products of the American Voiturette Co., Detroit, whose other product is the Big Keeton, up to this time generally has been considered more of a cyclecar than a large car. However, now that the public has had an opportunity to look it over it hardly seems that the Car-Nation can be relegated to the cyclecar class. The only features that are cyclecarish are the low price, $495, $510 and $520 for the side by side two seated, the tandem two-seater and the four-passenger touring respectively, and the low weight which is well under 1,000 pounds; aside from the fact, that the tread is less than standard, 48 inches.

It has a four-cylinder block L-head motor of quite respectable dimensions, the cylinders being 3 3-8 inch bore and 3 3-4 inch stroke. It has magneto ignition with fixed spark, Mayer carbureter, thermo-syphon cooling, adjustable belt-driven fan and pointed radiator. A disk clutch and three-speed gearset with propellor shaft through a torque tube to the semi-floating rear axle constitutes the transmission system. Left drive and center control are provided, wire wheels are stock, the wheelbase is 104 inches and the tire 30 by 3.

Saxon Light Car Details

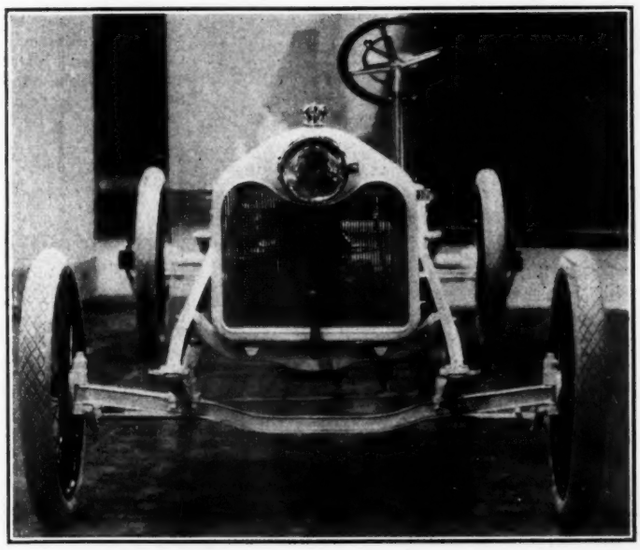
The little Saxon at $395 also makes its bow at the show. It appears only as a roadster, and has a four-cylinder block motor of 2 5-8 inches bore and 4 inches stroke. The motor is exceptionally business-like and cleancut in appearance, and is of Continental manufacture though of Saxon design; the four cylinders and the crankcase and exhaust and intake manifolds are made in one casting; a removable waterjacketed head fits over the cylinder block; vacuum splash is relied upon for lubrication: the carbureter is a Mayer and the ignition is by the Atwater Kent system with dry cells. A dry-plate clutch of 5 disks transmits power to the rear end where the three-speed gearset is mounted on the semi-floating axle; control is center and drive left; wire wheels are fitted with 28 by 3 inch tires.

Ward Has Novel Electric

The new Ward electric passenger car, first announced at the time of the electric show at New York last Fall is shown. Several models are exhibited. The details of these cars have been given in other issues.

Apperson Adds Two Sixes

The new Apperson sixes have a neat block motor design, with cylinders 4.25 by 5 in one model, and 3.75 by 5.5 in another. The motor, is a clean L-head casting, with separate intake and exhaust manifolds. The exhaust manifold is ribbed for cooling, and both secured by a set of angling yokes. The chassis characteristics of two models, are similar to Apperson construction, and have electric starter, left-side drive and the Apperson compression band clutch.



Front view of Briscoe chassis, showing headlight in radiator and novel line of front axle

Streamline Bodies at Importers' Salon

Somber Colors in Evidence—Foreign Makers Show Simple Lines Free From Trimmings—Streamline Designs Everywhere

By George J. Mercer

THE Automobile Salon, or, as it is generally called, the Importers' Show, formally opened to the public on Friday, at the Hotel Astor, has become recognized as showing the latest in foreign body creations; therefore the body designs are the paramount interest to many of the visitors.

This year the display is noticeably free from all ostentation; the entire exhibit is characterized by severe plainness and the color combinations as well as the interior decorations are soft effects with a tendency toward the darker shades. American-made bodies seem to be in greater proportion this year and strange to say the only examples of the ultra extreme in foreign design are of local production; there were no examples of the boat design or of the shell type with removable seats, or are there any touring bodies with the front seat made to swivel; these designs evidently have not made a hit in this country.

The Streamline Movement

The tendency on all bodies shows the desire to incorporate the streamline, flush-side idea and in addition all corners and edges are rounded off; this is noticeable on the radiators, which are higher and narrower, and with the top edge rounded. also the top line slopes upward toward the cowl. This blending of the hood line into the body lines is general throughout the salon and in a few cases the dash lamps are cleverly encased. No great progress has been made toward hiding the horn, however, and the mudguards do not show any improvement over last year, nor does the method of fastening the foot of the front windshield post to the cowl on the closed bodies; probably this is considered one of the earmarks of custom made-to-order work. Not all of the foreign makers consider this so and nearly all the cheaper cars spend more money in blending the union of the windshield and the cowl. The tire carriers exhibited are strong and sensible and particularly the one on the De Dion, Fig. 1, makes the spare wheel less conspicuous than ordinarily.

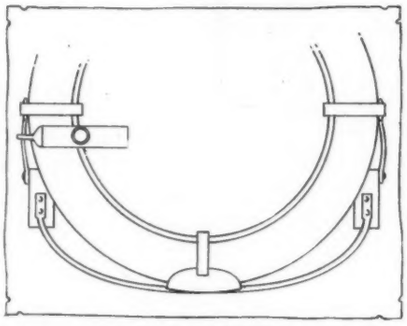


Fig. 1—De Dion Bouton tire carrier for rear which also accommodates spare wheels and makes them much less conspicuous than when they are carried on the side of the car. There is a general tendency in foreign and domestic bodies to better adapt the body to the tire carrier than formerly. One maker has gone so far as to design the body with a recess into which the spare wheel fits

The runabouts are not much in evidence in numbers, but those shown are all good designs and all have provision for carrying the third person. With one exception they have foredoors; with the runabouts as with the touring bodies the tendency is to raise the side line of the body and have the height of the seat back only a little higher.

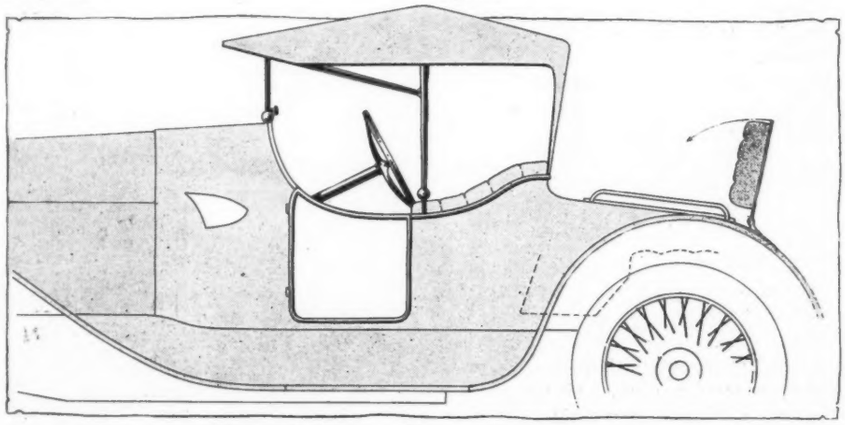


Fig. 2—Specially well-designed top on Isotta runabout, being a design of Moore and Munger. The disappearing rear set is more in evidence in runabouts than formerly

The illustration of a runabout design by Moore & Munger, Fig. 2, on an Isotta shows the tendency to make the rider comfortable in all weather; the trimming material is a cloth of dark color to further increase the warmth. The compartment at the rear is covered by the seat back and by one cover piece that lifts off.

Another example of the tendency to make this type of body comfortable for all weather, is the illustration of a Dieteren Frères body, Fig. 3, on the Minerva chassis. This body illustration shows a Victoria top of novel construction, and the method of folding it is also illustrated. This top is leather covered and the inside is lined.

Harmony in Flush Sides

The touring bodies were all flush sided, with sloping hoods that blend with the body cowl and the body sides are slightly higher. Two illustrations are given of the six-passenger body made by Holbrook. There are two of these bodies, one on a De Dion eight and one on a Mercedes. This type is one of the newest European designs and the disappearing top attracts much interest. It is also called the hollowside phaeton on account of the cavity or pocket all around the back and sides from the line of the door, and in which the top is stored. I think it is a mistake, however, on the part of the exhibitors, that one of these tops is not raised; the curiosity of the public is manifest by the frequent attempts to peer into the pocket that contains the top. The top, Fig. 4, when down, makes a clean, finished appearance. The space devoted for storing it is taken from the seat room and it is about 4 inches wide and deep enough to allow all the bows and the top cloth to be concealed. The opening is covered with the valence that is a fixture on the front bow, which valence covers the opening by being slightly wider and resting on the edges. The weight of the top is sufficient to keep this in place as well as from rattling.

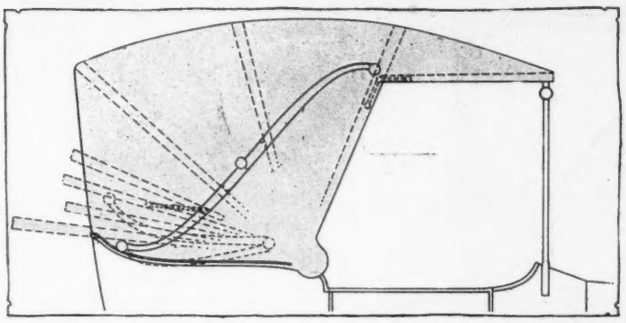


Fig. 3—Folding leather Victoria top on Minerva chassis with position of bows indicated for both the up and down positions. It is rare that a full leather top of this type is seen on a runabout body. This top is covered with leather, while the inside is lined with another material

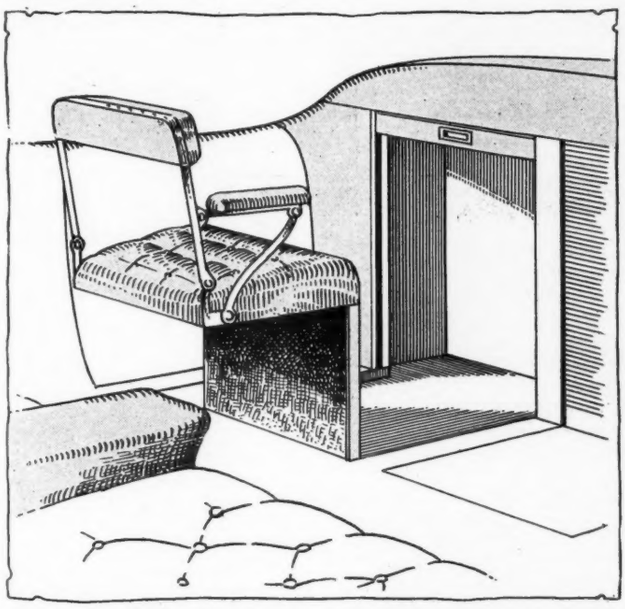


Fig. 5—Folding seat scheme in De Dion and Mercedes bodies. When folded the seat disappears within a compartment in rear of the front seat, this compartment having a drop door not unlike the cover of a roll top desk. When folded, the seat support forms a part of the tonneau floor

Folding the Top

The detail drawing shows the manner of operating the top which is locked to the front windshield when raised and the back bow rests on a projecting knob in the runway. To fold it down, it is only necessary to push this from the knob support and release the top at the front and it will automatically fold down.

As the illustration shows the entire top line of the body is rounded over and the flush-sided effect is intensified by the absence of the moulding around the doors. The trimming material of one body is leather and the other is a plush-cord effect that looks warm and comfortable. The valence of the bow to cover

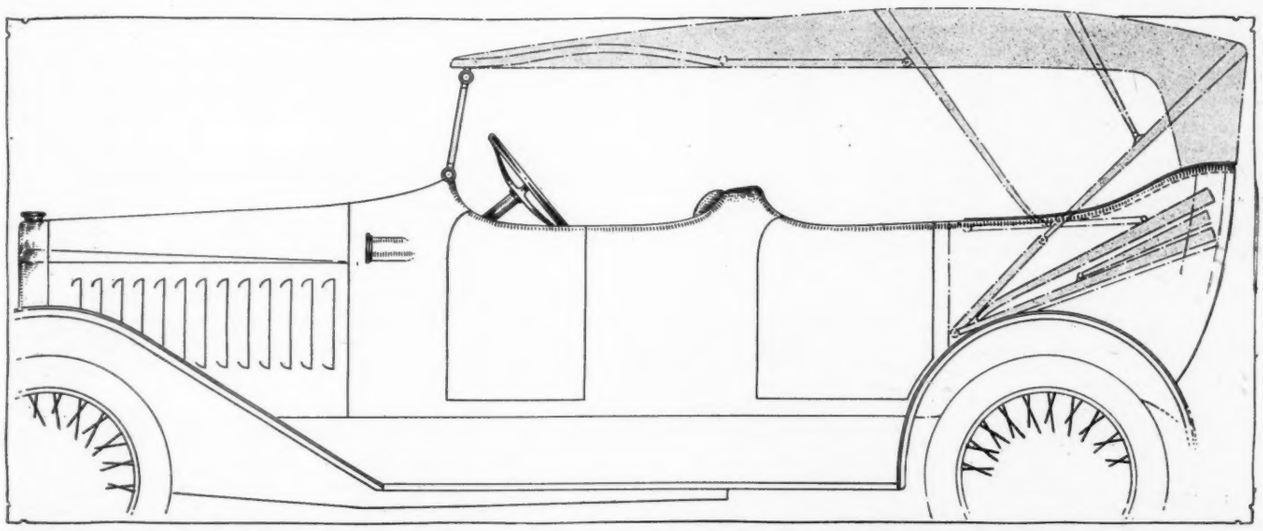


Fig. 4—A clean-cut and typical example of the complete streamline body seen on De Dion, Bouton and Mercedes chassis. This body has a compartment around the tonneau for accommodating the top when folded, where it is entirely hidden. Bodies of this type are being taken up in Paris by the leading body makers

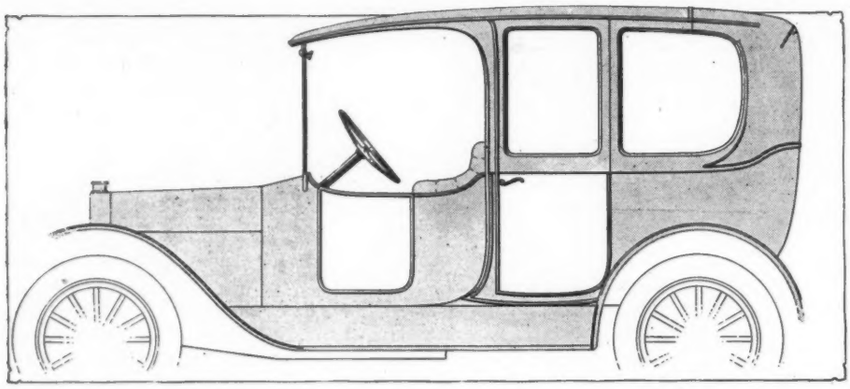


Fig. 7—Fiat limousine-landaulet with well-rounded corners as dictated by body fashions. The rear part of this top folds, all of the folding bars and braces being contained within the top

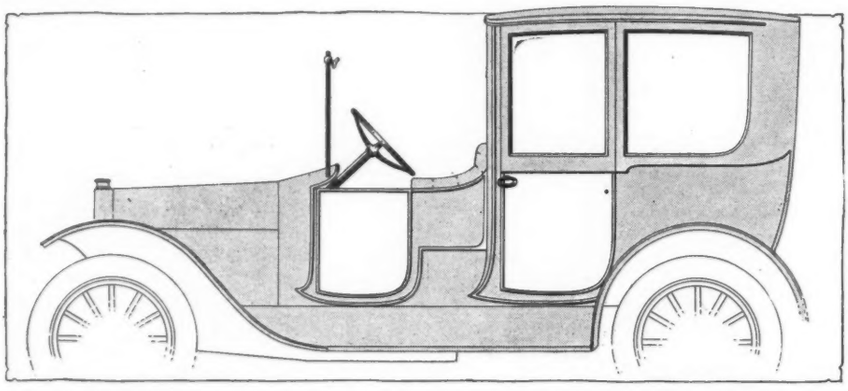


Fig. 8—Miniature town car body by Holbrook accommodating four adults inside. The rear corners are square and the front is made to be covered with a removable leather extension

the top pocket is of the same material.

Fig. 5 shows another view of this same De Dion body and illustrates the manner in which the extra seats are made to disappear. The view is looking toward the front and the receptacle for holding the seats is covered by a screen in the same manner as a roll top desk. One seat is in position and the other is folded down with the screen covering the opening. The floor forms the front leg or seat support. This illustration shows a portion of the rear seat and the manner in which the seat is divided with an arm rest so that not more than two persons can occupy the seat unless desired. This arm rest is removable at will and the seat can be made to seat more on occasions. The tendency is to accentuate that the rear seat is made for two and this is noticeable on all bodies. This same illustration gives a clear idea of the appearance of the cowl at top of the front seat, and it also shows how the trimming line does not project above the body line.

More Closed Bodies

Closed bodies are more in proportion to the total number than ever before and several all-weather bodies in which the driver is exposed except for the top, or touring landaulets as they are called, are exhibited. The tendency seems to be to make the bodies narrower; this has been induced by the desire to get neater lines. The rear seats are made for two and in many cases the disappearing seats fold up on the front division. This makes the body much smaller and also the narrow bodies make the drop lights a better mechanical operation.

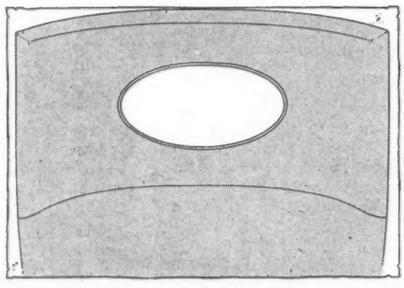


Fig. 6—The oval window is the fashion in the rear of limousines, and this illustration is of a Ketterer body on a Peugeot

Frameless Window Panes

Frameless glass are everywhere used and the majority have a lift catch for raising. In a few instances this is of glass and fastened direct to the plate by fusing. Mechanical lifters are not much used. The front light in most cases is one sheet without a division. The quarter lights are as large as possible.

There are no cabriolets exhibited. This is surprising as the foreign shows showed a marked increase over the number a year ago.

The oval-shaped rear light has one good example and this is illustrated; the body was a Ketterer design, Fig. 6, and shows on a Peugeot.

One design of a roof with well-rounded corners is illustrated, Fig. 7. This is a foreign body on a Fiat and is a limousine-landaulet. The rear quarter window is D-shaped but this will not help matters any when folded down. The job is small and the short overhang when down will possibly allow for this. The coupé pillar is rounded on the front edge and above the belt the door tee moulding is bent out to lie on the moulding surface of the pillar. The tendency is to show only a moderate drop to the roof line at the front and back.

Fig. 8 is a miniature town body by Holbrook, and is made for four inside. The extra seats fold up against the division. The body is simple in design, the rear corner being square. The coupé pillar shows parallel mouldings and rounded between. The front is made to be covered with a removable leather extension hood when required. There are more mouldings on the body front of the coupé pillar than is present custom, but the near view of the job makes this less noticeable than the illustration would convey. The

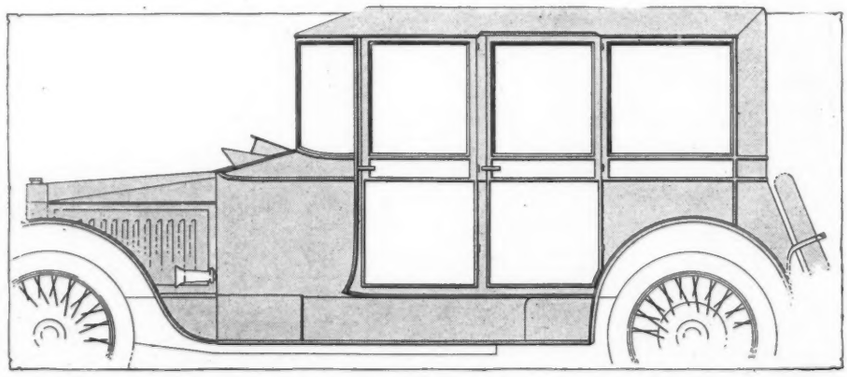


Fig. 9—Brewster salon-limousine made entirely of metal and which while designed along the lines of somber squareness embodies all the style that the designer can put into this type. This body is one of the attractions at the show, both because of its general appearance as well as its comforts as an all-weather vehicle

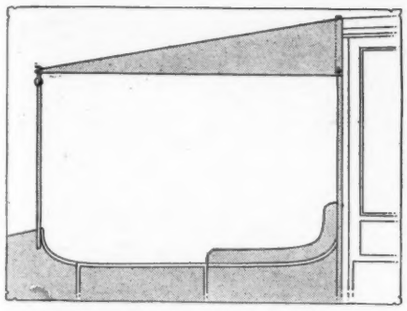


Fig. 10—Quick-removable extension top for over driver, which engages with a hook on the top of the windshield and secures by top fasteners to the top of the closed body compartment

color effect is dark and the interior is trimmed in light cloth.

Fig. 9 is a Brewster salon-limousine on a Delauney-Belleville. It is made entirely of metal, even the roof, and is the unique design at the show. It has all the class that Brewster can give the work and while there is a somber straightness to all the lines, still there is style to it as well.

Protecting the Driver

Many of the closed bodies have no permanent extension roof over the driving seat; this is the up-to-date practice on city cars. At times there is need of the portable extension roof, and the newest illustrations of this are on the Dieteren bodies on the Minerva chassis. Figs. 10 and 11 are two illustrations of these. The first shows a quick removable top consisting of leather shaped as illustrated and fastened at the rear with fasteners and at the front it hooks to the windshield, the leather at this place being reinforced with a metal plate that extends across the front and engages the two hooks. This is easy to fold, is light and the shape allows more protection than the customary extension roof used.

Fig. 11 is another Dieteren extension roof that is more complicated. This is illustrated in three views: the bottom one shows the roof extended; the middle one shows it back and fastened in position; and the top view shows the action of folding. This is a strong, light and flexible roof and is not to be detached. If required this can be done, but the metal moulding attached to the rear is fastened to the roof proper and is not intended for removal. The front end is locked to the windshield by the pin of the roof entering a hole in the post and the turning of the fastener on the side locks it.

In Many Forms

Fig. 12 shows the conventional extension leather roof. It can be thrown back on the roof and doubled as illustrated, or entirely removed. The front rests on the windshield and is fastened in the regulation way by the pin engaging in the post and being locked. The side members are made to retain their shape by joints that fasten to a cross tie at the front and at the back rest in position and are fastened by a pin that allows the revolving back on the roof.

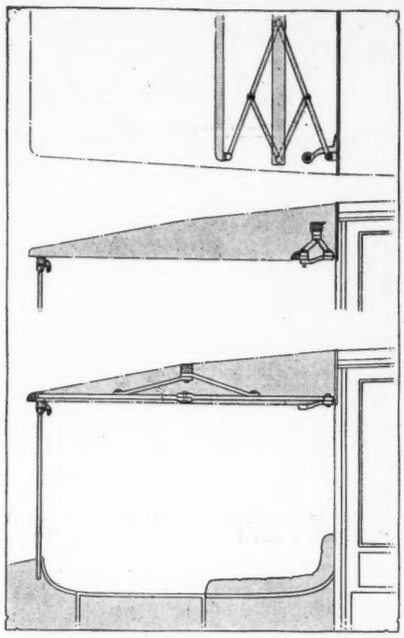


Fig. 11—A Dieteren extension roof for protecting the driver. The top illustration shows the action of folding; the middle one shows it in position; and the bottom one shows its framework system

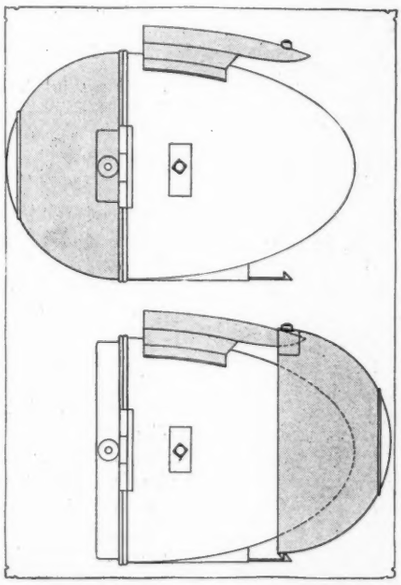


Fig. 13—Novel non-glare hemisphere fitted on Mercedes cars at Salon. The upper illustration shows the non-glare hemisphere in position, and in the lower illustration it is placed on the rear

Fig. 13 shows one of the means of dimming the headlights on the Mercedes. The dimmer is a hemi-spherical metal cup with a small frosted light in the center. This hemisphere is shown attached to the front of the headlight in the upper illustration for city driving. When dimming is not needed the hemisphere is removed from the front and fastens by latch and wingnut on the rear of the lamp body, where it is very rigidly supported. With the dimmer in position the headlight has an oval appearance which is quite attractive.

Bodies at the Palace

Space does not permit to publish in this issue a critical review of the bodies on American cars seen in the present show at the Grand Central Palace. This review will appear in the next issue of THE AUTOMOBILE. In the Importers' Salon as well as at the Palace there are not so many of the genuine streamline bodies as the makers would like you to believe. As a matter of fact streamline bodies are very rare and the maker who has simply flared the bonnet and effected a quiet transition into the cowl which continues itself into the body proper has only completed the first half of the streamline design. He must look to the back of the body and see that the streamline design is carried out there also. This does not mean that the rear must be as pointed as the front, but it surely does mean some effort to carry out in the rear tonneau curve the streamline effect of the front.

There are two genuine streamline bodies in the importers' show, but not a single example of it at the Palace.

American Cars Similar

Because of the very general adoption of the cowl dash and the slight flare on the bonnet there is a marked similarity among many American cars at the Palace, more so than among the fewer makes of European cars in the Importers' Salon. As most of the Salon bodies have been built by foreign and American body builders, it is, but natural to look for the latest body lines, and as a matter of fact, several of these are fashioned very closely after the latest styles seen at the recent Paris and London exhibitions.

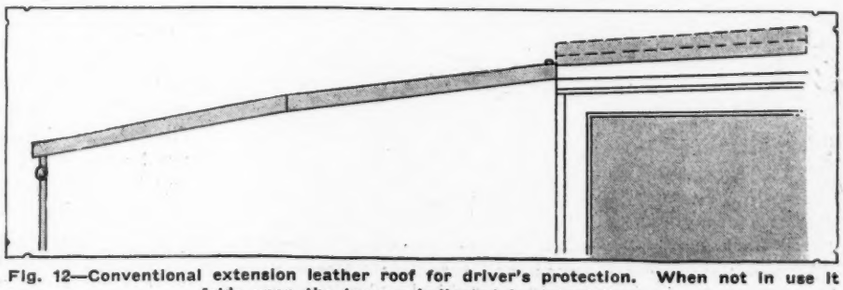


Fig. 12—Conventional extension leather roof for driver's protection. When not in use it folds upon the top, as indicated in dotted lines

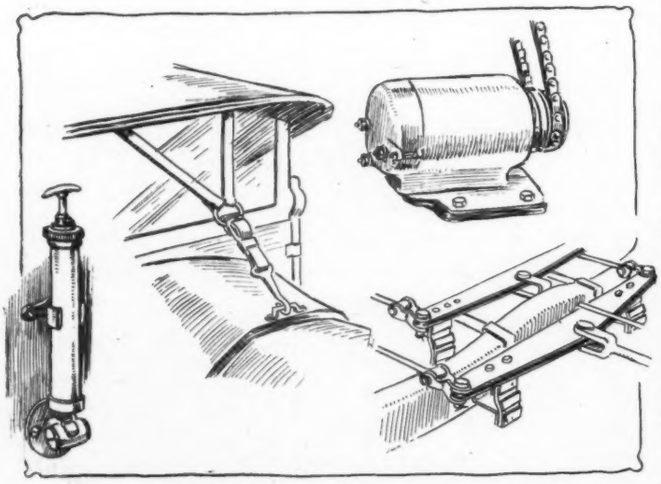
Thirteen Car Makers Exhibit

Marshall-Arter Appears for First Time —Two American Body Makers and Several Accessories

NEW YORK CITY, Jan. 2—The Automobile Salon opened here today at the Hotel Astor. Thirteen car makers have exhibits of their product on the floor and besides these, there were two American body builders who showed examples of their work as fitted to chassis of foreign design. Several accessory makers were also represented. The show will continue till January 10.

The car makers who are represented at the Salon are: Bugatti, De Dion, Delaunay-Belleville, Fiat, Isotta-Fraschini, Lancia, Mercedes, Peugeot, S. G. V., Simplex, Minerva and Marshall-Arter. The body makers are Holbrook and Brewster.

As in previous years, the exhibit is not a stock show as most of the bodies shown are either special jobs in body work or in the painting. They represent the highest degree of body-making skill and elegant upholstery work. The chassis, except for the S. G. V. and the Simplex, are imported from abroad and the body work is either imported or made by American concerns who cater exclusively to customers desiring special designs.



At left—Isotta pressure pump and top strap. Upper right—Minerva generator belt drive. Lower right—Simplex brake equalizer anti-rattle device

From a mechanical standpoint the show is always interesting as it shows the trend of design in Europe and is a sort of American aftermath to the Paris and London exhibitions. It is here that the American has the chance to see with his own eyes the features of European design of which he has read in the published accounts of the two great foreign shows.

The fine work on the European high-priced chassis is interesting, not only to the intending purchaser, but to many engineers who, not able to go abroad to the foreign shows, visit the Salon annually.

Marshall-Arter a Newcomer

The Marshall-Arter car is a newcomer to the show this year. It is in the small-car class and includes many unique constructional features. It is a cosmopolitan design in that it incorporates a French motor in an English chassis. The small engine rated at 12-14 horsepower delivers the drive through a cone clutch to a universal joint located three-quarters the chassis length aft. From this point a shorter shaft takes the drive to the two-speed, rear-axle gearbox. At the point where the universal joint is located a strong cross member connects both side angle frame members and the universal joint is supported from this cross member by a stiff bracket. There is only this one universal joint in the drive and the longer of the two shafts is practically horizontal at all times, the changes in slope of the short rear shaft being taken up by the joint.

The spring suspension of the car follows growing small-car practice in that cantilever springs are used at both the front and rear ends. The cantilevers have their heavy ends toward the center of the car and the light ends at the front and rear axles. In other words, they are placed butt to butt.

The carbureter is a Zenith and is bolted directly to the block motor, which has integral manifolds. The steering is by a bevel gear and bevel sector. Right drive and right control are used and in the control system a separate lever is provided for reverse. The car sells for $1,250 without the body.

Minerva Shows Three Models

Three Minerva-Knight cars are on the floor at the Salon and they attract attention for their advanced body work. The three models shown are known as the 18, 26 and 38, and they have motor sizes of 90 by 130, 100 by 140 and 125 by 150 millimeters. These motor sizes in inches are 3.54 by 5.12; 3.94 by 5.51 and 4.92 by 5.91. Minerva models are unchanged in a mechanical way for this season, but minor refinements have been made in the way of little conveniences throughout the car. The dash instruments are now mounted on a semi cowl board, which places them in reach of the driver and before his eyes and yet does not cut down the knee room. The cowl board is not continuous across the dash but is broken at the center. Three limousine

bodies are shown and these are all examples of modified streamline design. The heavily crowned fenders on these cars are a particularly noticeable detail. Wire wheels are shown on these cars.

Isotta Has Complete Exhibit

Six examples of Isotta-Fraschini workmanship are on the floor at the Salon. Roadster, coupé and limousine bodies by American body builders are shown and a 45-55 chassis. The chassis shown, which is a 1914 model, gives a good example of block motor design. The four cylinders measure 120 by 160 millimeters or about 4.72 by 6.30 inches. The manifolds are cast with the cylinders.

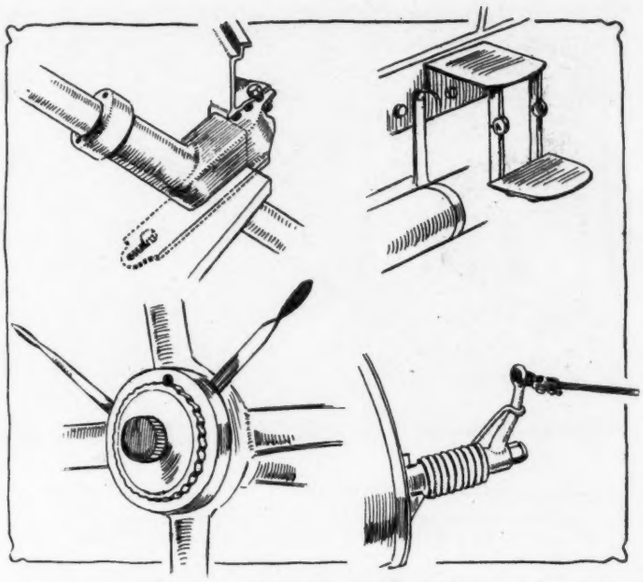
This is in every respect a high-powered motor, the diameter of the valves being 54 millimeters, or 2.12 inches. The lift of the valve is .4 inch which furnishes an exceptionally large area for the passage of the gases. On the chassis exhibited at the Salon a pressure feed gasoline tank is used in connection with a special adaptation of the Zenith carbureter. Pump circulation and trough lubrication are employed. The clutch is a multiple disk and the rear drive a bevel. The torque is taken by a forked tube which incloses the driveshaft and also is continuous around the rear axle, furnishing a stiff, unbroken structure.

The road clearance on the chassis is greater than on the average European chassis, measuring 10.5 inches. The frame is overswept at the rear axle and a compact appearance is given by the method of indenting the gasoline tank to clear the differential housing. The tire size is 895 by 135 millimeters or 35.24 by 5.32 inches. Hollow steel wheels are shown on this chassis.

One of the Isotta cars at the Salon is a Quinby limousine and it is fitted with a Jesco electric lighting and starting system. Another interesting car in the exhibit is a roadster design mounted on the 100-120 chassis.

De Dion Shows Five Models

Four complete cars and a chassis constitute the De Dion exhibit. The De Dion cars have been fully described in issues of THE AUTOMOBILE which dealt with the Paris and London shows, but some novel body effects are on the floor at the Salon. Of chief interest is a touring body by Holbrook which was shown mounted on a 50-horsepower chassis having an eight-cylinder 3.68 by 5.5-inch motor. The wheelbase on this chassis is 108 inches. The feature of the body, which is of streamline form, is the neat manner in which the top and extra seats fold out of the way. The top drops down into a pocket behind the rear seats and the extra seats fold into a well in the tonneau floor and into a compartment back of the driver's seat. These compartments are closed by shutters which are pulled down over them. In this particular body the shutters are latticed with mahogany. Back of the driver's seat a second instrument board is carried upon which a second speedometer, clock or whatever is desired can be mounted for the use of the passengers on the rear seat, enabling them to keep track of speed, etc.



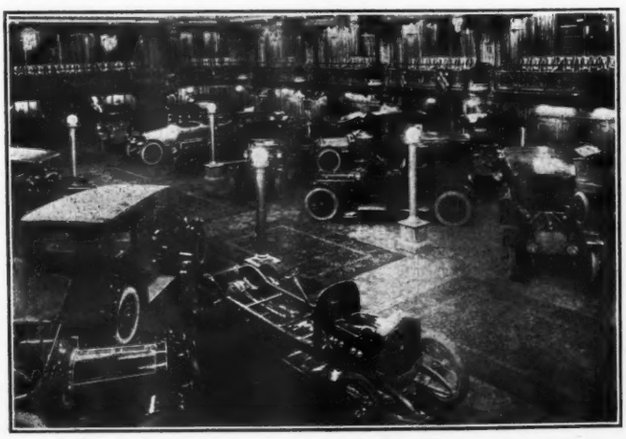
Upper left—Lancia adjustable steering column. Lower left—Lancia lighting control. Upper right—Mercedes folding step. Lower right—Cable operation of brake on S. G. V.

Simplex Exhibits New Chassis

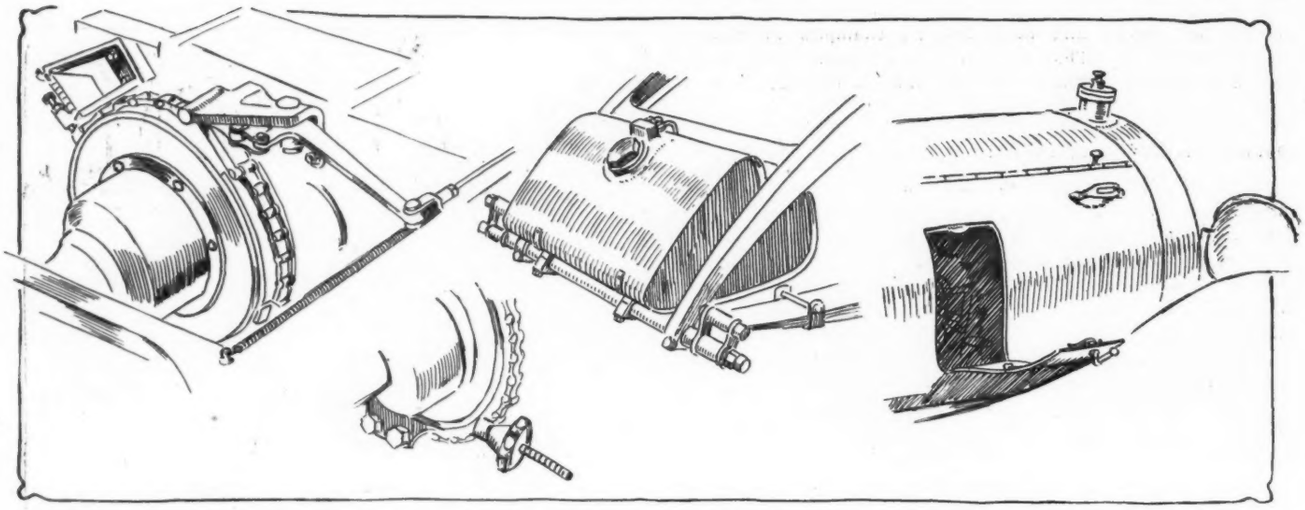
The new Simplex 50, which was recently announced, is on the floor at the Astor in chassis form. The remainder of the Simplex exhibit consists of a 38 chassis and four complete cars, two of which are touring models and the other two town cars. These two chassis furnish samples of shaft and chain drive as the 38 uses the shaft and the 50 uses a chain drive.

The new 50, which is of special interest owing to the fact that it is of late design, has a 5.375 by 6-inch motor which follows along the lines of former Simplex practice. The motor is a T-head with the four cylinders cast in pairs. A disk clutch and a four-speed amidships gearbox transmit the power to the jackshaft. The Rushmore lighting and starting system is fitted and the generator is driven directly off the crankshaft by means of an inclosed chain.

Many little refinements attract close attention on this chassis. One of these which may be mentioned is the anti-rattling feature on the brake equalizing mechanism. Thick strips of leather reinforced by pieces of metal prevent the equalizing bar from chattering and at the same time do not interfere with the freedom of motion of the bar.



Two views of the cars at the importers' salon, which opened Friday night at the Hotel Astor



From left to right—Two views of chain equalizer service brake used on the Lancia. Novel method of attaching the fuel tank on the Peugeot. On the Delaunay-Belleville adjustment of the carbureter is rendered easy by a hinged opening in the side of the hood

The 50-horsepower chassis shown is a replica of the 75-horsepower model as far as outside appearances go. Even the bore and stroke of the motors are the same, the added horsepower being secured by larger valves and manifolds and a steeper cam design. Wire wheels form a part of the Simplex exhibit as one of the models shown is so fitted.

Lancia Attracts Attention

With eight examples of work on the floor the Lancia company is well represented. Five closed bodies are shown mounted on chassis of various power and wheelbase, and a touring car, A stripped chassis gives the mechanically inclined a chance to study the details.

One of the interesting features in the Lancia exhibit is the adjustable steering column. With this the angle of the column can be raised or lowered to three different positions by simply loosening retaining nuts at the point where the column passes through the dash. Thus, if a woman desired to drive the car, the steering wheel could be brought closer to her or it could be brought higher to suit the requirements of another driver.

Another feature is the mounting of the lighting control switch on the end of the steering column. This type of switch provides for quick lighting and extinguishing of lights without relinquishing the grasp on the steering wheel and there is also a magneto short-circuiting button in connection with it that permits of a quick stopping of the car.

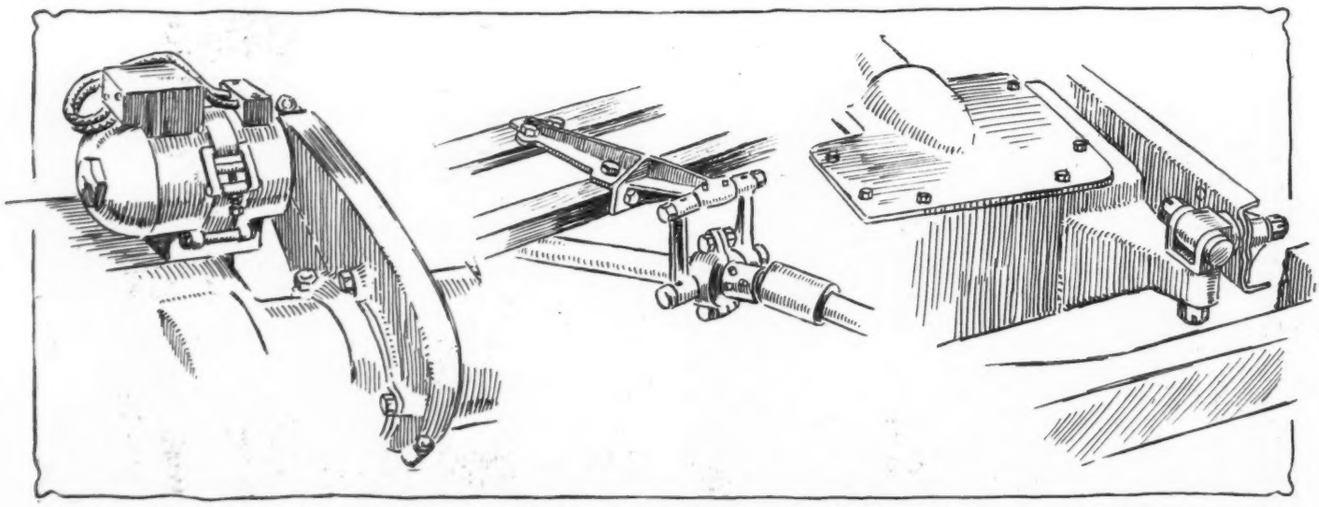
The service brake mechanism on the Lancia is worthy of special note. A chain which grips the brake shoe all around its circumference with an equal amount of tension is used to apply the pressure on the drum. In this way the brake shoe wears evenly all the way around instead of in one or two places on its circumference.

Peugeot Shows All Sizes

The Peugeot exhibit is exceptionally complete in the range of sizes. The Lion-Peugeot factory which turns out the smaller Peugeots is represented by a Baby Peugeot model, a small roadster and a light touring car. The touring car and roadster are mounted on the same chassis, except that in the case of the touring car the wheelbase is longer. In the larger Peugeots a limousine and a stripped chassis are shown.

Peugeot chassis work as exemplified in the exhibit at the Salon shows typical European practice throughout. The transmission brake is air cooled, having fins to provide a radiating surface. The crankcase is also provided with cooling ribs. A pressure gasoline feed is used on the chassis shown and in this connection the novel method of bracing the fuel tank at the rear of the chassis may be mentioned. The tank is a modified wedge shape as shown in the illustration and it is braced between the ends of the frame side members and supported by a cross bar at the rear.

(*Continued on page* 163.)



Left—Generator drive from the mainshaft on the Simplex. Center—Marshall-Arter propeller shaft support. Right—Method of mounting the gearbox on the De Dion

Exhibit of Devices for Increasing Comfort and Decreasing the Expense of the Automobilist Is the Best Ever Seen at the New York Show

THE present exhibit of accessories at the Grand Central Palace is one of the best that has been seen at a New York Show, notwithstanding the fact that numerous accessory lines are not being exhibited, excepting in small quantities, such as tires, bearings, axles, etc. There are several magneto people who are not exhibiting and the number of concerns showing carbureters, windshields, jacks, and other accessories is smaller than a year ago. There is, however, a very general increase in certain lines of accessories, such as lamps, motorcycles, speedometers, castings, and other small tool parts.

The accessory manufacturer is getting a better opportunity at the present exhibition than he has at any previous shows in Madison Square Garden or Grand Central Palace. The present show has motor cars occupying the entire two first floors and a part of the third floor, leaving the accessories for the remainder of the third floor and the entire fourth floor. The elevator system in the Palace is an express route from the first floor to the top. You cannot get out at the second or third floor but must go to the top. When you get at the top you must walk down as the elevators will not carry you. The net result of this is that everybody reaches the top floor and walks down through the accessories finishing his or her business on the main floor. The value of this wise arrangement is quite evident by the good distribution of the crowds on all four floors.

In the following pages is a cursory review of the leading accessory tendencies. This review will be supplemented during successive issues of this month by exclusive articles dealing with different lines of accessories, such as carbureters, tires, magnetos, speedometers, power tire pumps, etc.

Carbureters Tend Toward Type of Construction Without Moving Parts

THE trend of development in carbureters is plainly toward that type which is free from moving parts, although one leading maker, who builds types with moving parts or auxiliary air valves controlled by springs, ventured the explanation that the American buyer is not yet ready for the carbureter that is free from auxiliary air valves and other adjustments. Such firms as Wheeler & Schebler, Stromberg and Rayfield, continue with the auxiliary air valves, Stromberg having one model which belongs to that class without moving parts. On the other hand there is a big crop of concerns making carbureters without moving parts including such names as Holley, Zenith, Stewart, and Master. Breeze has recently joined this division. The carbureter without moving parts is designed to do away with the auxiliary air valve and is generally quite free from springs or parts needing adjustment.

Fuel Pumping Action an Innovation

An innovation in carburetion is that of incorporating what may be termed a fuel pumping action which accompanies rapid opening of the throttle. It is often the case that when the throttle is suddenly opened the motor hesitates for a few revolutions, failing to get the gas immediately. To obviate this the new positive-type Breeze has a plunger pump interconnected with the throttle so that opening and closing the throttle reciprocates the pump plunger. The pump barrel is connected with the float chamber and also by a small passage with the manifold above the throttle. With the throttle closed the pump plunger is raised permitting the pump barrel to fill with gasoline to the level in the float chamber. Suddenly opening the throttle forces the pump plunger into the barrel and forces the gasoline out into the manifold where it is ready for instant use, in a word the engine then immediately responds to the sudden opening of the throttle.

One of the most unconventional carbureters is the Master from California, which has its gasoline jets in a rectangular-shaped piece of copper or brass which by the removal of a single screw can be withdrawn from the carbureter. This piece of metal is approximately 2 inches long, 1-4 inch thick and 1-2 inch high. The gasoline enters it along the bottom and is led to the top through a series of thirteen, fourteen or more miniature openings or nozzles. A horizontal revolving barrel throttle brings these nozzles into operation, the principle of operation being not unlike that in the Polyrhoe, a foreign design exhibited a year or so ago.

Schebler has a new model R which while following regular Schebler lines of concentric construction with cork float, differs in having only one adjustment, which is on the auxiliary air valve. This valve is interconnected with the needle in the nozzle for regulating the flow of gasoline. The model O double-jet type of 1913, is continued as are the other Schebler types.

Stromberg has a new model GA, which is made in all sizes and has what is known as the balanced auxiliary air valve. The

valve is in the form of a metal cylinder open at its lower end where it works in a well in the casting. The restricted air openings in the well prevent any fluttering when the valve is working. This model also has a shutter valve in the hot-air horn, which valve is interconnected with the starter pedal so that when working the starter the shutter valve closes, shutting off the air and insuring a rich mixture for starting. There is control of the auxiliary air valve on the steering column, to hold the valve closed for starting. The G & A is made with single or double nozzles for four or six-cylinder cars.

The Newcomb is made with a new model 17 which has several improvements. It uses an offset float chamber in place of the concentric types; has all of the air entering through a single orifice; has dash control for raising or lowering the metering pin in the nozzle; and has an accessible drip cock and trap in the side of the float chamber for draining same and removing any sediment. There is a new model F for cycle cars. Another feature is a Ford type which is so made that without any change in manifolds or connections it can be fitted to any Ford motor.

The new Sunderman is an addition to the ranks of those having no moving parts or auxiliary spring-controlled valves. There is a new model of Carter carbureter with glass float chamber and ring-type metal float in place of the ball float used on previous Carter models.

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Three New Models of Spark-Plugs To Be Seen—Slight Refinements

AS is to be expected there is very little that is new in the spark-plugs exhibited. Three new models brought out by as many different concerns are in evidence. A. R. Mosler Co. has introduced a new Vesuvius, with either open or closed ends; the Champion Ignition Co. has a new plug characterized by an extra large porcelain; and the Silvex Co. is displaying a new design called the Dragon which is similar to the Bethlehem plug made by the same concern, but has only two points.

Of the other spark-plug makers at the show, some have made slight refinements, but a great many of them have made no changes at all in their models for this year. Small improvements have been made in the Red Head plugs put out by the Emil Grossman Mfg. Co., and the Champion Ignition Co. The Bougie Mercedes plug has also been altered to give increased durability, by enlarging the firing disk. No changes whatever have been made in the plugs shown by the Western Electric Co., the Brown Co., the Randall-Faichney Co., the Splitdorf Electrical Co., or by G. A. Faw.

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Automatic Advance the Keynote of Progress in Magneto Construction

THE magneto situation for this year shows at least one well-developed trend and that is toward automatic advance. Two companies have joined the ranks of those who fit their magnetos in this way; they are Eisemann, who has added automatic advance to its domestic models and will continue it on its imported machines. Herz furnishes the automatic feature with any magneto. Bosch is continuing its automatic magneto without change.

One of the important changes of the season has been made by Remy, who has abandoned the inductor type of magneto altogether and in its place uses a low-tension armature type. These magnetos are used in connection with a coil of which the company furnishes two types for use with its magneto, one a dash instrument and the other fitted to the engine base.

Splitdorf and Herz have added new magnetos. The Splitdorf is intended for small four-cylinder cars and is made to S. A. E. standards throughout. It is marketed under the model name of E. U. 4. The Herz had been designed particularly with an eye toward meeting the demands of the cyclecar. It is particularly light in weight and if desired can be fitted with automatic advance.

Refinements have been through the entire gamut of the magneto line and these include improvements in breaker box design, better waterproofing and greater adaptability to any make of car. Kingston has a better breaker box mechanism; Mea has more careful waterproofing; K. W. has added an impulse starting device; Bosch is now adaptable by special fittings to the Ford car; and Dean announces improvements in the Hi-Fre-Co. system. The only manufacturer who has dropped the magneto is the Champion company which now concentrates on spark-plugs.

Heinze has two or three new instruments. One is a new high-tension dual, one for four-cylinder motors under 5 inches bore; with it the double armature winding is used as a step-up coil to get the starting spark. There is also a high-tension instrument for sixes up to 5-inch bore. There is also a new magneto with rocking armature for high-powered motors.

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Reliability and Ease of Operation the Aims in the Warning Signal Field

WARNING signals, electric and other types of horns, like other necessary automobile accessories, have already undergone sufficient development that the improvements from 1 year to another now are slight. This year appearance has come in for much more consideration, but minor changes in the way of reliability and ease of operation of the sound-producing mechanism are noticeable. There has been an influx of hand-operated horns, many made by the electric horn manufacturers, as a supplement to their previous lines.

The four classes of warning signal for 1914 are: One—the electric motor driven; two—the electric vibrator-hammer type; three—the hand-operated; and four—the exhaust horn. Excepting the exhaust horn the other classes exist largely because of the difference in the cost of manufacture, for the sound note provided by them is not dissimilar. The electric horn has the advantage that the horn itself and the means of operating it can be widely separated, the popularity of the under-hood position of the horn arising out of this advantage. But the smaller and neater appearance of the projectors this year renders external application of hand-operated horns possible without detracting from the appearance of the car. The torpedo or straight type of horn projector is shown by practically all makers this year. This has all the desired effect in the way of sound projection and is yet inconspicuous.

Improvement of the tone in the electric horn has been aimed at by using a casing over the mechanism of sufficient weight to prevent the unpleasant "tinny" note. The push button has received more consideration to render it immediately responsive to the touch, an important feature in dangerous traffic.

Regarding the surface finish, practically all makers are supplying black, black and nickel or brass, and all-brass or nickel, the demand seemingly being distributed among all these finishes.

No developments of importance have taken place in the exhaust horn, but a wide range of single- and multi-tone instruments are available and all are easy of application.

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Minor Improvements and Refinements Characterize Speedometers for 1914

VERY little development has occurred in the speedometer field in the past year as evidenced by the exhibits of the six makers at Grand Central Palace. Slight refinements have been made here and there, but no radical changes have been brought forth. A few new models are shown, but in the main the lines of the different concerns are much the same as they were last year.

Three different methods are employed in the instruments shown for indicating speed: the centrifugal principle is found

in the Jones, Standard, Corbin-Brown and Elyria-Dean; the Veeder uses a hydraulic type in which a colored liquid rising and falling indicates the speed; Stewart and Warner instruments employ a magnetic device, a revolving magnet producing a torque on the indicating arm.

The Elyria-Dean is a newcomer. It works on the centrifugal principle. The speed-indicating mechanism consists of a ball-race in which four steel balls are carried and over which a steel cup fits. As the container rotates these balls are forced out by centrifugal force raising it in proportion to the speed of rotation.

Several New Speedometers Shown

Two new models are noticed among the instruments made by the Stewart-Warner Corp. One is a new Warner that sells for $40 and the other is a new model hub odometer. A refinement on the Warner speedometers is the direct drive which allows larger figures to be used on the odometer dial.

Jones instruments which are marketed by the H. W. Johns-Manville Co., have larger figures on the new models making reading much easier. A new model has been brought out for use on trucks and electric passenger cars. Its feature is a 30-mile range which allows the use of figures that are much larger and more easily seen.

A hub odometer is the new thing in the Veeder line. It takes the place of the ordinary hub and is only slightly larger than it. The drive is obtained by a small pin that is inserted in the end of the axle shaft. There are six dials making it possible to read up to 100,000 miles by tenths.

No changes and no new models are seen at the exhibit of the Standard Thermometer Co., the complete line that was shown last year having been continued without change.

Corbin-Brown speedometers are represented by eight models varying in size from the 3-inch model with 60-mile dial to a clock combination with an 80-mile range.

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Folding Windshields with Automatic Fastenings are Popular

THE exhibit of windshields is not so extensive as that in former years, only four concerns exhibiting, which is largely due to the fact that today the majority of companies are selling their cars equipped with windshields. All exhibiting show folding types with automatic fastening. A couple of them show single-pane types. English & Mersick Co. and Cox Brass Mfg. Co., both of which are for roadster and torpedo types. The one novelty in the windshields exhibited is the combination mirror attachment of the Hammon tri-vision shield made by Hammon Co. The mirror is in the form of a narrow strip extending entirely across the top of the upper pane, and is hinged to permit of being set at any angle, and held in place by wing nuts. It can be tilted forward or backward as needed and serves also for ventilation.

Adjustable Windshields for Tonneau

Another novelty is the adjustable shield for the tonneau, which attaches to the ends of the seat under the cushion, the supports rising between the seat arms and the cushion. This shield is a two part one, one-half attached to the support at each end of the seat. These halves can be swung forward to any desired position in front of the rear seat passengers and automatically stay where placed. Each part is a one-pane glass, which is high enough to give ample protection and extends down almost to the knees. When not in use each half swings against the side of the tonneau. This is marketed by A. N. Clark & Son.

With all of these concerns the rain-vision and ventilating types of shield are in greatest demand. These are divided types which for rain vision swing the upper half forward and for ventilation swing the lower half either forward or back as required. Wing nuts are generally used to anchor the panes in either of these positions, although rarely used when folding the upper half.

From the standpoint of the top maker a most important windshield improvement is that of providing means for anchoring the top by short straps to the windshield instead of strapping it to hooks on the frame members at the ends of the radiator. The windshield maker is providing ball-and-socket, or other, types of joints by which connection is made direct to the windshield instead of using a leather strap. Where the leather strap is used there is a hook on the shield to which the strap attaches.

There are one or two concerns that sell windshield cleaners for use in wet or snowy weather. One of these is marketed by the Gabriel Horn Mfg. Co. and another by the Springfield Metal Body Co. Both of these are in the form of rubber knife blades, which are moved over a part of the glass surface in front of the driver.

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Novel Emergency Wheel Takes Place of Broken Axle or Wheel

NOVELTIES are scarce in the accessory field, but one not seen before is the Meiner's emergency wheel, which is intended to be used in assisting a car to the garage which has broken a wheel or axle. The Meiner's wheel is a steel artillery one 12 inches in diameter with a metal tire. It is mounted on a short axle with a bracket at each end by means of which, you can bolt the wheel underneath the spring and so get the car to the repairshop, instead of having to trail the broken end on a piece of timber as is so often done.

Box for Holding Top When Down

Another novelty is the Golde top box, which is an aluminum or wood box of horseshoe shape which fits around the tonneau at the top so that the top when lowered folds into this box. The boxes are made to conform to the contour of the tonneau. The box is bolted to the rear of the body and takes the place of the usual top envelope.

There is a very small exhibit of lifting jacks only three concerns showing them and one of these is the Walker-Moore Mfg. Co. which shows jacks intended to relieve tires of the weight when in the garage. These jacks are in sets of four, one for each wheel. Each jack is a lever type with hook, which engages under the hub, and one push on the lever lifts the wheel. There are not any gears, or reduction mechanisms in it.

For regular lifting purposes the Hartford Suspension Co. has its gear type jack, which has been on the market for several years. Charles E. Miller shows several jacks and is marketing a type of his own known as the Miller, which is a ratchet type.

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Refinements in Shock Absorbers

AS in other lines of automobile accessories, little change has been made in shock absorber construction during the year and this is only what can be expected considering the many years that shock absorbers have been made. The field is still quite evenly divided among the friction, spring type and hydraulic. This would seem to indicate that all these designs have been found satisfactory.

In quite a few models refinements are seen and these are either with a view of increasing the durability of the mechanism or else to make its operation more automatic. Three entirely new designs have been brought out, spring absorbers by the Sager Co. and the Meechaley Auto Co. and a novel type by the Herz Co. There is a new Hartford type with three friction adjustments and this company also has a new cushion spring that is designed to absorb the small road vibrations. It is attached to the rear spring shackle.

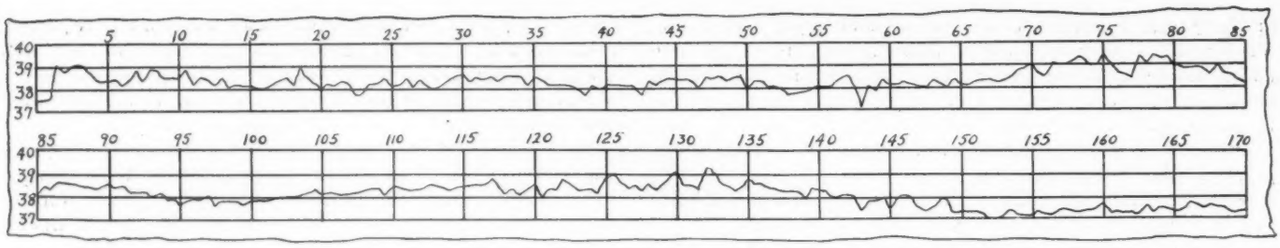


Chart showing the horsepowers during the first half of the Moline-Knight endurance run

Moline-Knight Finishes 336-Hour Test

Averages 38.3-Horsepower—Shows 53 Horsepower for Hour Power Test—Fuel Economy Good—Sets International Endurance Record

NEW YORK CITY, Jan. 6—The official report of the 336-hour endurance test of the four-cylinder Moline-Knight sleeve-valve motor, which completed this test at 7 o'clock p. m. January 6 has been made public by Herbert Chase, Laboratory Engineer of the Automobile Club of America, in whose laboratories this test was conducted. As indicated in previous reports the motor made a remarkable performance averaging 38.3 horsepower for the entire 2 weeks of the run, this horsepower being generated at a crankshaft speed of 1,117 revolutions per minute. During this entire test the throttle was wired wide open and the spark put in a fixed position. No alterations whatever were permitted, and during the run not a spark plug was changed or an adjustment of any nature made that in any wise affected the horsepower output. When the run was more than half over the fan belt came off and was not used during the remainder of the run.

The test sets a new international record for motor testing, being the longest test of a motor made in this country or abroad.

During the 336 hours, the Moline-Knight motor, which was the second of its type built by the Moline Automobile Co., East Moline, Ill., which has recently taken out a license for manufacturing the Knight sleeve-valve motor, ran without a falter. Its horsepower readings were taken at 15-minute intervals throughout the entire 2 weeks, these readings being shown on the official charts reproduced herewith. During this period the lowest power recorded was 36.4 horsepower. According to the rules the motor was required to show 28.8 horsepower, this figure being stipulated by the Automobile Club of America. The S. A. E. horsepower rating is 28.16 at 1,100 revolutions per minute, so that the average of 38.3 is high above its official rating.

At the completion of the 336-hour period, and before the motor was allowed to stop, an additional run of 1 hour was made in order to demonstrate that the motor is capable of generating more than 50 horsepower, which is the figure guaranteed by the Moline company. During this hour it averaged 53 horsepower at a crankshaft speed of 1,678 revolutions per minute.

With this test completed the motor was given a 5-hour fuel economy test at an average speed of 1,114 revolutions per minute. During this run the horsepower averaged 39.8 and the fuel consumption was .63 pounds per brake horsepower-hour.

Following the fuel efficiency test there was one on volumetric efficiency the report of which is shown in the tabulation herewith.

The final test was one for developing a horsepower curve and was in all respects similar to the same test made before the start of the 336-hour run. In this test the motor was run for 5-minute periods at different crankshaft speeds beginning with 300 revolutions per minute and advancing to 1,750. In this test the motor showed a steady increase in horsepower over the test made before the start of the endurance run, in other words the motor actually increased in horsepower output during the test. The increase shown on the chart which forms a portion of the complete report indicating a gradual increase of more than 1 horsepower.

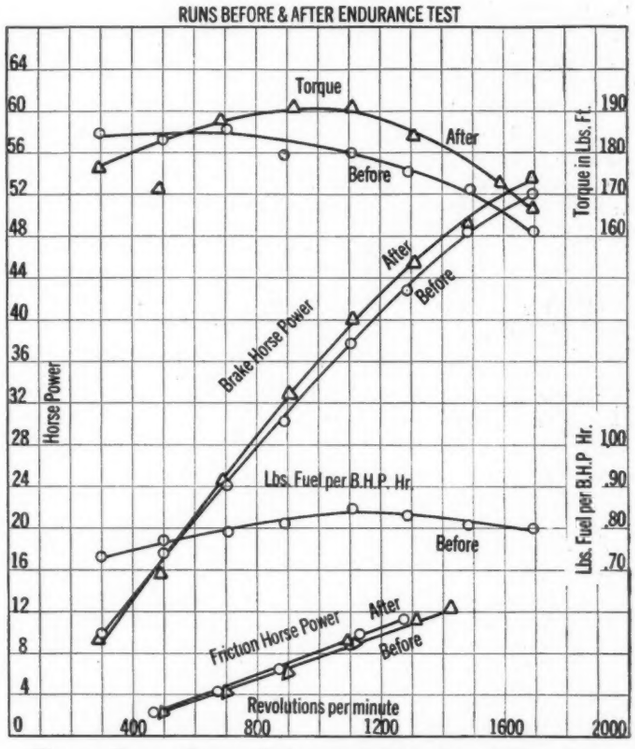
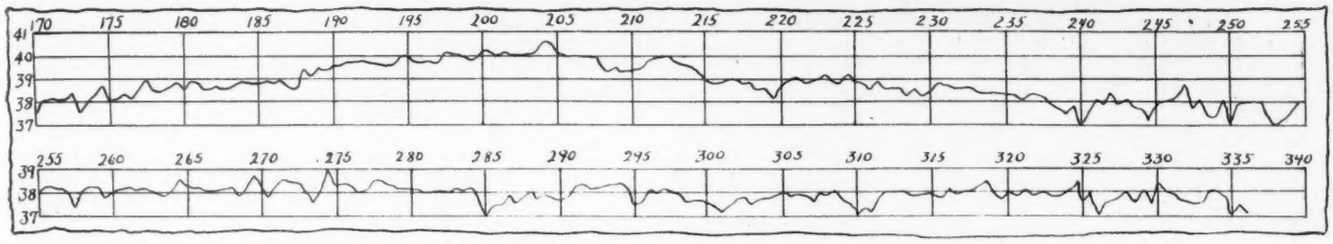


Fig. 1—Power Curves Before and After the 336-Hour Run

The curves made in tests before 336-hour run are indicated by circular points, and those after the run by triangular points. The two diagonal curves marked brake horsepower show a maximum of 53.6 horsepower at 1,682 revolutions per minute in the final test, which was higher than the test before the 336-hour run.

The two top curves marked torque show the turning energy of the crankshaft at 1 foot radius before and after the test. A comparison shows higher turning effort in the test after the run than before.

The single curves marked lbs. fuel per B.H.P. hour show the gasoline consumed in developing the torque and horsepower curves made before the run. The friction horsepower curves show the amount of power needed to drive the Moline engine under compression, without firing the charge. This power was lower in the final test than at the preliminary test. It should be noted that the upper curve was taken Before and the lower After, instead of as indicated



Second part of endurance chart, showing horsepowers through the last half of the run

When these various tests were completed, the entire motor was taken apart by the club officials and all parts inspected by the laboratory engineers. Herbert Chase, in charge of the laboratory, has reported that he could not find a single thing to criticise in this inspection. There was not any wear indicated on any of the sleeve valves, the bearings were in perfect condition, and not a piston ring was found to be stuck in its groove. After the parts were removed, each was officially sealed by the club and placed before the visiting engineers at the annual mid-winter session of the Society of Automobile Engineers, and later put in the Moline booth at the Grand Central Palace show.

The official report issued by the A. C. A. follows in complete form.

Official Report on 337-Hour Endurance Test of Four-Cylinder Moline-Knight Motor
(Certified Test No. 12)

This is to certify that the Technical Committee of The Automobile Club of America has tested the Moline-Knight motor, manufactured by the Moline Automobile Co., with the following results:

Power.—The motor ran without any stop whatever for 336 hours with wide-open throttle and set spark at an average speed of 1,117 r.p.m. During this period the average brake load at 1 foot radius was 180 pounds, giving a resultant average brake horsepower of 38.3. The lowest horsepower reading for any 15-minute interval during the entire 336 hours was 36.4.

At the end of this period, without stopping motor, the speed was increased, and the motor developed an average of 53.0 brake horsepower for a period of 1 hour, while averaging 1,678 r.p.m. The variations in power plotted by half-hour intervals for the entire run are shown graphically in Chart No. 1A. Averages for 5-hour intervals are given in Table No. 1.

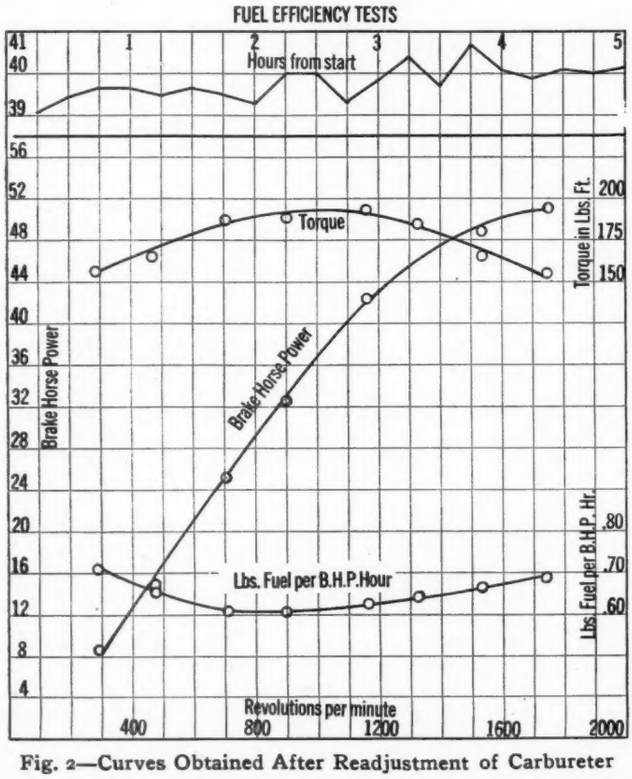


Fig. 2—Curves Obtained After Readjustment of Carbureter

These curves were obtained after the 336-hour test, when the carbureter had been readjusted to take advantage of the improving tightness of the rings and other parts of the motor. The top curve, Chart 3, shows the horsepower developed during five hours run to determine the efficiency after the long trial. The lower curves show the torque brake horsepower and fuel consumption during runs of 5 minutes duration on each speed to determine the fuel efficiency of the motor at all speeds after the 336-hour test

Fuel Consumed in Test

The total fuel supplied during the run of 336 hours was 10,645 pounds, or 1,744 gallons. It was found at the end of the endurance test, however, that a small hole had been worn through the fuel supply pipe at a point where the latter chafed, due to vibration, against a joint on the crankcase. The leakage of fuel from this hole was not discovered because of the rapid evaporization brought about by the blast of air used to cool the crankcase. By observation of the fuel curve given in Table No. 3, it is evident that the rate of fuel consumption gradually decreased for the first 160 hours, and thereafter increased to the end of the test, indicating that the leakage started at or about the 160th hour, and gradually became greater thereafter. The average consumption per hour for the first 160 hours was 31.5 pounds. For the last 10 hours of this 160-hour interval it was 30.8 pounds per hour. The actual consumption for the remaining 177 hours of the test is questionable because of fuel leakage.

The gasoline used was taken from the same supply regularly delivered for use in the club's garage, and gave an average Beaumé reading of 61.6° at 60° F., equivalent to 0.733 specific gravity.

Oil Used in Test

The total quantity of oil put into the motor during 337 hours' running in the endurance test was taken from thirty-four sealed 5-gallon cans, giving a total supply of 170 gallons. A total of 7 quarts were taken from the motor during and following the test, leaving a net supply of 168.25 gallons. Throughout the test oil was overflowing from the flywheel bearing. In 15-minute runs prior to and following the endurance test, the average overflow was found to be about 0.87 pint per hour. Assuming that the average rate of loss throughout the endurance test was the same as the average loss in the short runs before and after, the total loss in 337 hours would be 36.6 gallons, leaving a net total consumption of 131.6 gallons (967 pounds), or 0.39 gallon per hour. The oil used was supplied by F. H. Floyd, Detroit, Mich., who states that it was compounded from Russian and domestic stock.

Short Runs at Start

Prior to and following the endurance run, a series of short runs was made—with wide-open throttle and spark set for maximum power—to determine the power, friction and fuel consumption of the motor at various speeds. The same carbureter setting employed during the endurance run was used in these runs. The maximum brake horsepower shown in these tests was 53.6 at 1,682 r.p.m. The results of these runs are given in Table No. 2 and Chart No. 2.

Fuel Efficiency Test

In order to demonstrate the ability of the motor to run with lower fuel consumption than that shown in the endurance run, and other runs mentioned above, the carbureter was readjusted, and the motor thereafter subjected to a 5-hour run at an average speed of 1,114 r.p.m., and a series of short runs at different speeds. The average brake horsepower for the 5-hour run was 39.8 and the average fuel consumption 0.63 pounds (equivalent to 0.108 gallons) per brake

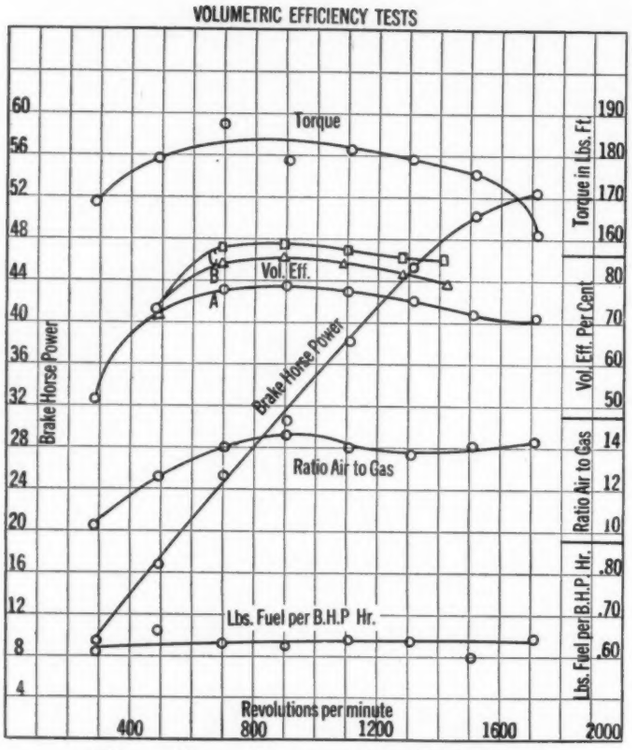


Fig. 3—Shows Chart 4 of the Official Report

The upper torque curve, the volumetric efficiency curve A, the air and gas weight ratio curve, the brake horsepower curve and the bottom fuel consumption curve were obtained by taking 5 minute readings at each speed shown.

The engine was then run without ignition by the dynometer to obtain the volumetric efficiency curve B, which test was afterwards repeated without the carbureter to obtain the curve C

horsepower-hour. For complete data of these runs see Table No. 3 and the corresponding chart (No. 3).

Volumetric Efficiency Test

Following the fuel efficiency test the carbureter, with no change in adjustment, was enclosed in an air box, which was clamped between the carbureter flange and the inlet manifold. The sole air inlet to this box was piped to a Venturi air meter, and the air consumption of the motor measured under the following conditions:

(a) Carbureter in place, motor running under own power.

(b) Carbureter in place, motor driven by dynamometer.

(c) Carbureter removed, motor driven by dynamometer.

From the air, power and other measurements taken in this run the volumetric efficiency and other data given in Table No. 4 and Chart No. 4 were obtained.

Adjustments During Test

The only adjustments made on the motor during the endurance run had to do with the fan and its driving belt. At the 131st hour fan stopped, due to heating from slipping belt and gummy oil. The fan was removed, the bearing cleaned and the fan and belt replaced. At the 179th hour the belt was so loose that it hit fan blades and jumped off. In applying a new belt the thin outer rim of the V-pulley was broken and belt was removed. The fan (which is one piece with pulley) was removed at 182d hour. During the 326th hour a new fan and belt were put on, but belt jumped off after about 10 minutes' running, and was not replaced until after endurance run.

Cooling and Exhaust

During the test thermo-syphon cooling was obtained by connecting the motor to a tank of water placed in approximately the same relative position to the motor as the radiator on the Moline car. Sufficient cold water was added to the warm water in the tank to maintain an average temperature of 85° F. of water entering motor. The average temperature of water leaving motor was 166° F.

The exhaust from the motor was discharged into a short length of 2½-inch standard pipe, and thence into an expansion chamber from which it escaped to atmosphere through a long 3-inch vent pipe. The exhaust gas was slightly smoky during a portion of the test.

A blast of air, having a velocity of about 34 miles per hour was directed against the crankcase of the motor during the endurance and other runs in which the motor was developing power.

Atmospheric Conditions of Test

There was a wide variation in atmospheric conditions during the test, the temperature of the air blowing on the motor varying from 37° F. to 71° F., with an average of 57° F., while the barometer varied from 28.95 inches to 30.19 inches of Mercury, with an average of 29.83 inches. It was noted that the power of the motor increased and decreased as the barometer rose and fell.

Motor Not Worn

The motor was dismantled before and after the tests here reported to permit careful inspection thereof. At the end of the test the parts of the motor were, without exception, in excellent condition. There was no perceptible wear on the bearings, sleeves or other parts. The slight irregularities in the sleeves were built up with carbon to form close fitting, glossy surfaces.

The ports in the sleeves were not burnt, and there was only a very slight deposit of carbon on the port edges.

The cylinder heads and the tops of the pistons showed only

TABLE NO. 1.—ENDURANCE TEST—AVERAGE POWER AND FUEL CONSUMPTION BY 5-HOUR INTERVALS

HOUR		AVERAGE		GASOLINE PER B.H.P. HR.		HOUR		AVERAGE		GASOLINE PER B.H.P. HR.		HOUR		AVERAGE		GASOLINE PER B.H.P. HR.	
From	To	R.P.M.	B.H.P.	Lbs.	Gals.	From	To	R.P.M.	B.H.P.	Lbs.	Gals.	F om	To	R.P.M.	B.H.P.	Lbs.	Gals.
0	5	1127	38.5	.83	.136	111	115	1113	38.4	.82	.134	221	225	1114	38.9	.81	.133
6	10	1119	38.5	.83	.136	116	120	1116	38.4	.82	.134	226	230	1109	38.5	.82	.134
11	15	1114	38.3	.83	.136	121	175	1115	38.4	.82	.134	231	235	1114	38.0	.82	.136
16	20	1116	38.3	.83	.136	126	130	1121	38.7	.81	.133	236	240	1108	37.9	.83	.136
21	25	1117	28.1	.83	.136	131	135	1122	38.7	.81	.133	241	245	1112	37.8	.84	.137
26	30	1114	38.2	.83	.136	136	140	1118	38.4	.82	.134	246	250	1114	37.9	.84	.137
31	35	1124	38.4	.83	.136	141	145	1116	38.6	.82	.134	251	255	1111	37.7	.83	.136
36	40	1117	38.0	.92	.136	146	150	1120	37.8	.82	.134	256	260	1115	38.0	.84	.137
41	45	1122	38.2	.83	.136	151	155	1122	37.4	.82	.134	261	265	1114	38.1	.83	.136
46	50	1122	38.4	.82	.136	156	160	1123	37.5	.82	.134	266	270	1116	38.1	.84	.137
51	55	1113	38.0	.82	.134	161	165	1116	37.4	.83*	.136*	271	275	1122	38.2	.84	.137
56	60	1117	38.1	.88	.136	166	170	1112	37.6	.82	.134	276	280	1121	38.2	.84	.137
61	65	1118	38.1	.83	.136	171	175	1115	38.1	.83	.136	281	285	1122	37.9	.85	.139
66	70	1114	38.5	.82	.134	176	180	1116	38.5	.82	.134	286	290	1122	37.7	.86	.141
71	75	1119	39.0	.82	.134	181	185	1112	38.6	.82	.134	291	295	1121	38.2	.85	.139
76	80	1112	39.0	.81	.133	186	190	1114	39.1	.81	.133	296	300	1118	37.9	.84	.137
81	85	1110	38.6	.82	.134	191	195	1114	39.6	.80	.131	301	305	1115	37.6	.85	.139
86	90	1110	38.5	.82	.134	196	200	1114	39.8	.80	.131	306	310	1120	37.7	.85	.139
91	95	1113	38.1	.82	.136	201	205	1120	40.1	.80	.131	311	315	1116	37.8	.86	.141
96	100	1113	37.8	.83	.136	206	210	1118	39.6	.81	.133	316	320	1118	38.0	.85	.139
101	105	1108	38.0	.82	.134	211	215	1124	32.6	.81	.132	321	325	1116	38.0	.85	.139
106	110	1109	38.3	.82	.134	216	220	1107	38.6	.82	.134	326	330	1120	37.9	.86	.141
												331	335	1120	37.6	.86	.141
												Pow er and		Fuel Dur ing 337th		Hour.	
												336	337	1678	53.0	.80	.131

*NOTE:—Leak in gasoline pipe probably started at this point. Fuel readings thereafter are probably in error, *i.e.*, too high. See Text and Chart No. 1B.

TABLE NO. 4.—VOLUMETRIC EFFICIENCY TESTS

Run	Duration, Mins.	R.P.M.	Tor., Lbs., Feet	Brake H.P.	Cu.Ft. Air per Minute	Pounds Air per Hour	Pounds Gas per Hours	Ratio Air to Gas.	GAS CONSUM. PER B.H.P. HR. Lbs.	GAS CONSUM. PER B.H.P. HR. Gals.	Vol. Eff. Per Cent.	TEMPERATURE WATER In	TEMPERATURE WATER Out	PRESSURE Air Ent. Carb.	PRESSURE Drop in Inlet, Ins.Hg.	Barometer, Ins. Hg.
							Engine	Running	Under O	wn Powe	r					
A3	6	1715	160.5	52.5	105.2	47.8	33.5	14.3	.64	.105	70.5	96	183	64	1.8	29.28
B3	5	1523	176.0	51.1	95.4	43.2	30.3	14.0	.60	.098	71.4	90	175	57	1.6	
C5	5	1318	179.5	45.1	87.3	396.	28.9	13.7	.64	.105	75.9	89	176	56	1.5	
D3	5	1108	181.0	38.2	75.3	341.	29.3	14.0	.64	.105	78.0	88	173	56	1.2	
E3	5	902	179.0	30.8	62.2	282.	19.1	14.8	.62	.102	79.0	89	178	56	1.0	
F3	4	701	188.0	25.1	48.1	218.	15.6	14.0	.62	.102	78.6	94	166	55	0.8	
G3	5	491	179.5	16.8	31.2	141.	11.3	12.5	.67	.110	72.9	95	172	55	0.4	
H3	5	295	169.0	9.5	13.1	59.	5.8	10.2	.61	.100	51.0	100	160	54	0.3	
							Carbure	tor On—	Throttle	Wide—	Engine	Driven by	Dynamo	meter.		
J3	1	1428	.....	.....	98.8	.....	.....	.....	.....	.....	79.2	Me	an	62	1.6	29.31
K3	1	1285	.....	.....	91.6	.....	.....	.....	.....	.....	81.6	Jac	ket	62	1.4	
L3	1	1093	.....	.....	80.6	.....	.....	.....	.....	.....	84.5	Wa	ter	62	1.2	
M3	1	894	.....	.....	66.5	.....	.....	.....	.....	.....	85.3	Tempe	rature	61	1.0	
N3	1	692	.....	.....	50.4	.....	.....	.....	.....	.....	83.5	11	7	60	0.8	
O3	1	481	.....	.....	30.2	.....	.....	.....	.....	.....	72.0	deg.	F.	60	0.4	
							Carbure	tor Off—	Engine	Driven b	y Dynam	ometer				
P3	1	1405	.....	.....	104.0	.....	.....	.....	.....	.....	85.0	Me	an	58	0.8	29.31
Q3	1	1275	.....	.....	94.9	.....	.....	.....	.....	.....	85.2	Jac	ket	60	0.5	
R3	1.17	1101	.....	.....	84.6	.....	.....	.....	.....	.....	87.9	Wa	ter	60	5 4	
S3	1	881	.....	.....	68.5	.....	.....	.....	.....	.....	89.2	Temper	ature	60	0 3	
T3	1	695	.....	.....	53.5	.....	.....	.....	.....	.....	88.3	11	2	60	0.3	
U3	1	486	.....	.....	30.2	.....	.....	.....	.....	.....	71.3	deg.	F.	59	0.3	

a very thin coating of carbon and only small quantities of carbon were found elsewhere.

No shake could be felt in any bearing, and there was every indication of perfect lubrication. There was not a single ring in either piston or cylinder head which was not perfectly free at the end of the test.

The running of the motor as regards noise and vibration was not appreciably different at the end of the test from that at the start and early hours.

Motor and Fittings

The manufacturer of the motor has filed with the club an affidavit which states that the motor is a stock model in every particular, including design, material and workmanship, except as to the hot air supply pipe for the carbureter, which was not used during the test, and which will be cast integral with the crankcase in all motors, except the first six produced. Of these six the motor tested is one.

The motor is of the four-cycle type, and has four cylinders cast in one block with integral gas manifolds. The functioning of the motor is controlled by two eccentric sliding valves with inlet and exhaust ports on opposite sides. The sleeves are actuated by short connecting rods, operated from a common eccentric shaft, and have a travel of 1⅛ inches. The bore of the inner sleeve, in which the piston travels, is 4 inches, and the piston stroke is 6 inches. The eccentric shaft and magneto are driven by silent chain from the crankshaft.

Motor Lubrication

The motor is lubricated by a pressure feed system which operates as follows: Oil is drawn from the pump by a gear pump driven off the end of the eccentric shaft, and is delivered to the three main bearings and the magneto drive shaft bearing under a pressure determined by the settings of a spring-controlled bypass valve, through which the excess oil is delivered. The excess oil is led to the chain driving the eccentric shaft and magneto, and flows thence to a trough and through a screen to the sump. Part of the oil delivered to the main bearings passes through holes in the crankshaft web to the crank pins, and thence through the tubular connecting rod to the hollow piston pins. From the two ends of the latter it flows to the sleeves and is distributed through holes and oil grooves in the latter over their circumference and the cylinder walls. All parts requiring lubrication not mentioned above are oiled by splash from the crankshaft and connecting rods. The flow of oil delivered under pressure is determined by a valve which is so connected as to open and close with the throttle. This valve was wide open in all tests here recorded.

There are no oil grooves in any of the crankshaft bearings.

Ignition and Carburetion

The carbureter employed was a 1½-inch nominal size, model R Schebler, which has a tapered needle whose position in the nozzle is controlled, through a lever connection, by the position of the air valve. No changes in the carbureter setting were made during the endurance test.

Ignition was furnished by a Bosch DU Model 4A Duplex magneto. Four Bosch plugs with heavy three-point electrodes were put in at the start of the test, and none of these were taken out of the cylinder or otherwise disturbed until after the endurance test was completed. The electrodes were partly burned away, so that the gap was increased, but the regularity of firing was notable throughout.

(Signed) F. H. Hutton,
Chairman Technical Committee.
(Signed) Herbert Chase,
Laboratory Engineer.

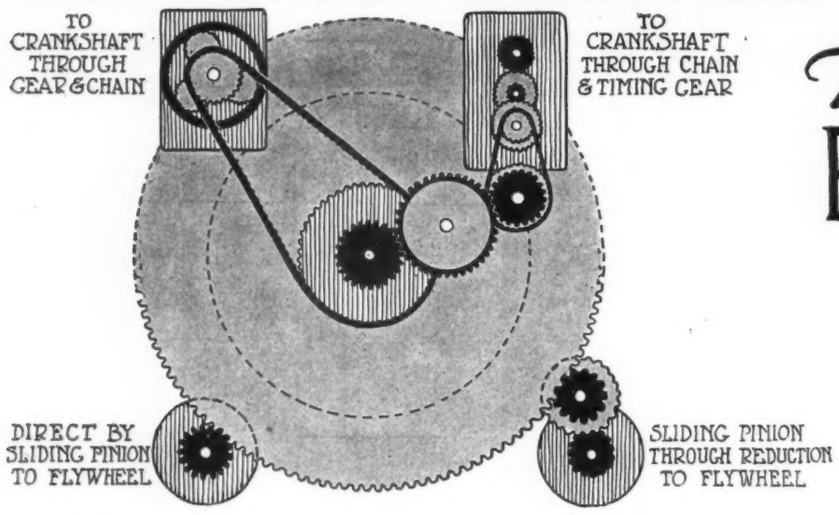
The Moline-Knight motor is a design which differs in many respects from the Knight types in use and is the result of 2 years' investigation and development by Owen Thomas, of

(*Continued on page* 163.)

TABLE NO. 3.—FUEL EFFICIENCY TESTS

SHORT RUNS AT VARIOUS SPEEDS										5-HOUR TEST AT CONSTANT SPEED					
Run	Duration, Mins.	R.P.M.	Torque, Pounds, Feet	B.H.P.	GAS CONS. PER B.H.P. HR. Lbs.	GAS CONS. PER B.H.P. HR. Gals.	TEMPERATURE JACKET WATER In	Out	Range	HOUR From	To	AVERAGE R.P.M.	B.H.P.	GASOLINE PER B.H.P. Lbs.	Gals.
A2	5	1739	154.3	51.1	.69	.113	93	184	91	0	1	1116	39.5	.64	.105
B2	5	1529	167.5	48.8	.66	.108	87	173	86	1	2	1108	39.5	.63	.103
C2	5	1325	183.3	46.3	.64	.105	85	176	91	2	3	1116	39.8	.64	.105
D2	5	1161	192.2	42.5	.63	.103	93	173	80	3	4	1120	40.2	.63	.103
E2	5	899	189.0	32.4	.61	.100	90	177	87	4	5	1112	40.0	.63	.103
F2	5	706	187.0	25.1	.61	.100	102	174	72			1114	39.8	.63	.103
G2	5	465	167.0	14.8	.66	.108	102	177	75						
H2	5	288	158.5	8.7	.71	.117	107	167	60						
		Average	Barometer	Reading	=29.37										

Average Barom eter Readin g =29.45 ins.
Average Jacket Water, In. =91 deg.F.
Average Jacket Water, Out =172 deg. F.
Average Jacket Water, Ran ge =81 deg.F
Average Room Temperatu re =56 deg.F



The Electric Starter Field

Special Considerations of Starting Motor Design—Light Weight and Small Size Essential—Review of the Field

By Sydney Oxberry

The Problem

¶ The necessary provision of a storage battery on the automobile for lighting purposes is a direct reason for the existence of the electric starting motor of today.

¶ Its suitability was immediately recognized on its introduction and the suddenness of the demand 2 years ago resulted in some unsatisfactory work owing to insufficient consideration of the problem and the need for applying the starter to an already designed engine.

¶ Actual practice has made deficiencies evident and the starter problem has become more defined. The requisite features of the satisfactory electric starting motor are:

1. A totally inclosed series wound motor furnishing sufficient torque to spin the engine through suitable reduction gear at a speed of from 70 to 100 revolutions per minute.

2. The magnet casing to be of a size and shape that render the motor easily applicable to various positions about the engine.

3. If the connection to the engine is made through a sliding pinion on the flywheel, the actuating mechanism to be interconnected to the starting switch so that the pinion slides into mesh and the motor starts with a single movement of the pedal or other means of operation.

4. The starting switch of the pinion-flywheel type of starter to be arranged to turn the motor slowly at moment of engagement to eliminate gear noise, either by the insertion of a resistance or momentary disconnection from the circuit.

5. Other methods of applying the starter to the engine include chain and gear drive to crankshaft. In these no starting resistance is required.

6. In order to provide for the circumstance of the starter remaining in engagement with the engine after the latter has commenced firing the fitting of a one-way clutch in the drive is essential. Otherwise the motor would be back driven through the reduction gear by the engine at an enormous speed with burning up as the probable result.

THERE can be no question that the overwhelming predominance of the electric starter in the automobile field is a direct outcome of the cleanliness and handiness of the electric light. There are other types of starter and quite possibly some of these may show advantages not possessed by the electric. In the matter of economy, for instance, convincing figures that will make useful comparison are not numerous. But whatever the result of such tests it must be always remembered that the electric starter rests on the necessary provisjon of a battery for lighting purposes. The weight and space occupied by the battery may as well be utilized for starting if the apparatus required in addition is of a simple and reliable nature. The latest designs of starting motor can be said to meet these requirements.

The suddenness of the demand for the electric starter in 1912 produced much work in the way of attachment that could scarcely be otherwise than unsatisfactory. The many designs now being shown for the 1914 cars show very obviously a great improvement, the result partly of a better understanding of the subject by the electrical designer but even more because of the co-operation of the engine designer.

Although this working together of the electrical man and the car builder has resulted in many excellent designs that seem to point the way to a highly satisfactory type of starter, it is equally certain that a large number of motors are doomed to extinction. What has happened is that a number of small electrical manufacturers have invaded the field of the old established motor builder. Some have produced a motor the equal of the big manufacturer and some have not.

The problem will appear more clearly when it is realized exactly what is required by the car builder. This resolves itself into a straight series motor—disregarding for the moment the possibilities of the single unit machine which by the way are

not inconsiderable as is shown by the existence of a few well designed combinations—providing the maximum of torque in the minimum of space, furnished with end-covers which totally inclose the machine, and with a magnet casing of such a shape that it can be readily attached to the engine, the whole to weigh as little as possible. All this can be done well by the manufacturer who has had no connection with the automobile industry. But there are a few points in design to be attended to that many of the smaller manufacturers who are acquainted with the detail requirements of the automobile know much more about than the purely motor builder who may be able to turn out a better job electrically.

Motor Design Considerations

To begin with, the exceptionally small voltage of 6 which has become standard for the lighting circuit on automobiles is new to the electrical designer. And he is liable to err in the mass of iron required for the field magnets and the amount of copper necessary to carry the proportionately heavy current. The point often overlooked is that for starting purposes the motor is only required to run a minute or two at a time and therefore conductors and other parts that would heat up can be kept down to the minimum cross sectional area. But even more important in this straining to obtain a large torque in a small motor is a realization of the small amount of insulation that is necessary for such a low voltage. All the space taken up with unnecessary thickness of insulation is exactly that amount of loss in the permissible size of the conductors.

The above remarks apply in particular to the armature winding and the size of the slots but the same conditions are met in the field and field windings. Here the essentials are to provide for a certain number of ampere turns around the poles and, a magnetic path through the poles and steel casing of sufficient cross section to carry the required degree of magnetization. These amounts are worked out by the motor designer, but there is a wide range of possible ways of meeting them as far as size and shape are concerned. In a cylindrical motor, for instance, with four poles, the same strength of magnetic field can be obtained by the use of long poles with a shallow layer of conductors as can be produced in a motor with short poles and a heavier winding. The first means

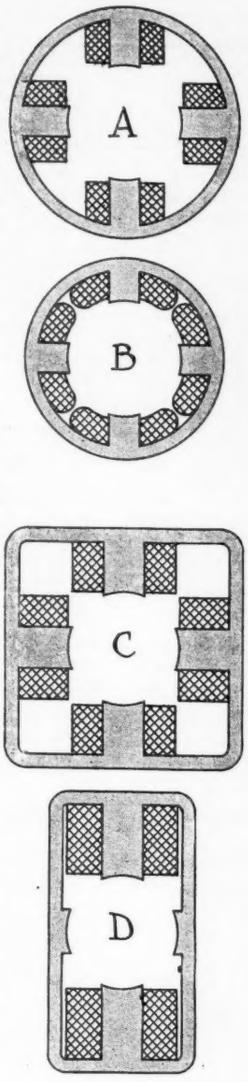


Fig. 1—Starter design, showing round and square types of magnet and method of obtaining compactness through field winding considerations and filling of magnet spaces

a much larger casing and is heavier than the second for the same power. This is shown in the diagrams, A and B Fig. 1. To have much air space inside the magnet shows a non-utilization of space for power purposes. This point is also brought out in the rectangular type of motor casing C and D. If this is square and has four wound poles there must of necessity be a greater mass of iron to the degree of magnetization obtainable than would be necessary if only two poles carried coils and the magnetic path were made shorter by using a narrower rectangular casing. Summing up these purely electrical considerations it will be evident that the real aim of the designer should be to obtain a concentrated and correctly proportioned mass of iron and copper.

Methods of Application

Size and weight with reference to power are extremely important considerations but the method of applying the motor to the gasoline engine is even more interesting, if the great variety of installations, Fig. 2, are any criterion. This problem brings out questions of, ease of application, space available, efficiency of operation, silence, absence of wearing parts and simplicity of the starting operation from the point of view of the driver.

As regards space this varies so largely with the particular motor that it is a leading factor in the determination of which of the three principal methods of connecting up the starter shall be used in a given case. The three general classes of application referred to are: 1, by a sliding pinion meshing with teeth on the periphery of the flywheel; 2, by chain or gear to the front end of the crankshaft, and 3, by driving through the timing gear from the pump or magneto shaft. This latter method is really a variation of the second, the timing gear being brought into use to reduce the amount of external gearing necessary. Not included in these classes are the fitting of the motor to the transmission and the utilization of the rotating member of the starter as flywheel mass. Of this latter there is only one example in extensive use. Its chief merit is that all gearing is dispensed with and there is in consequence no wearing parts except the brushes which are common to all motors.

The tables on page 53 shows the popularity of the various methods of installing the electric starter on the automobiles of 1914. It will be seen that the flywheel method predominates. It is ac-

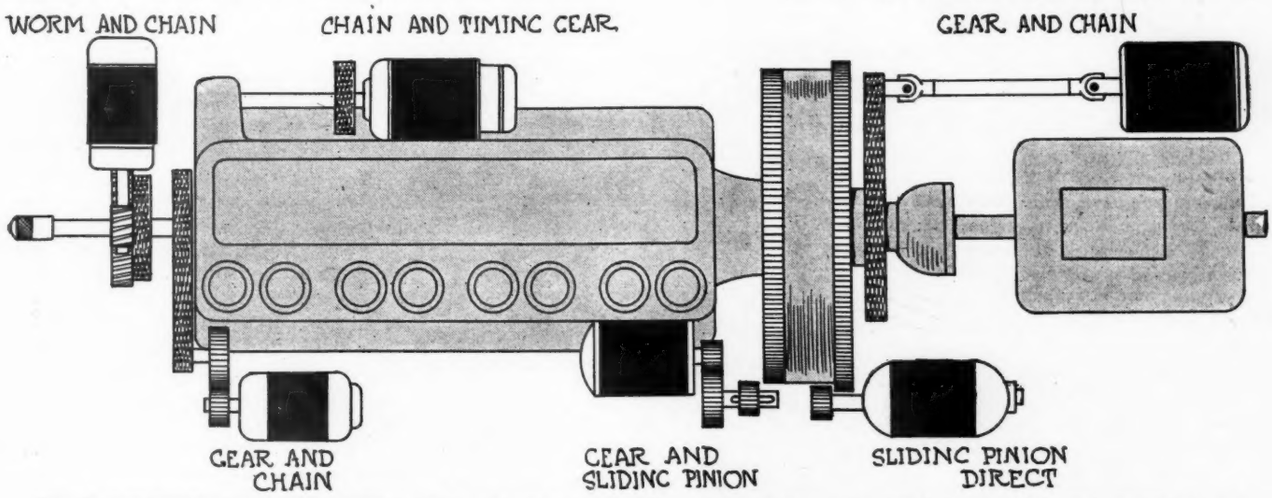


Fig. 2—Automobile engine viewed from above, showing several of the extensively used methods of applying the electric starter

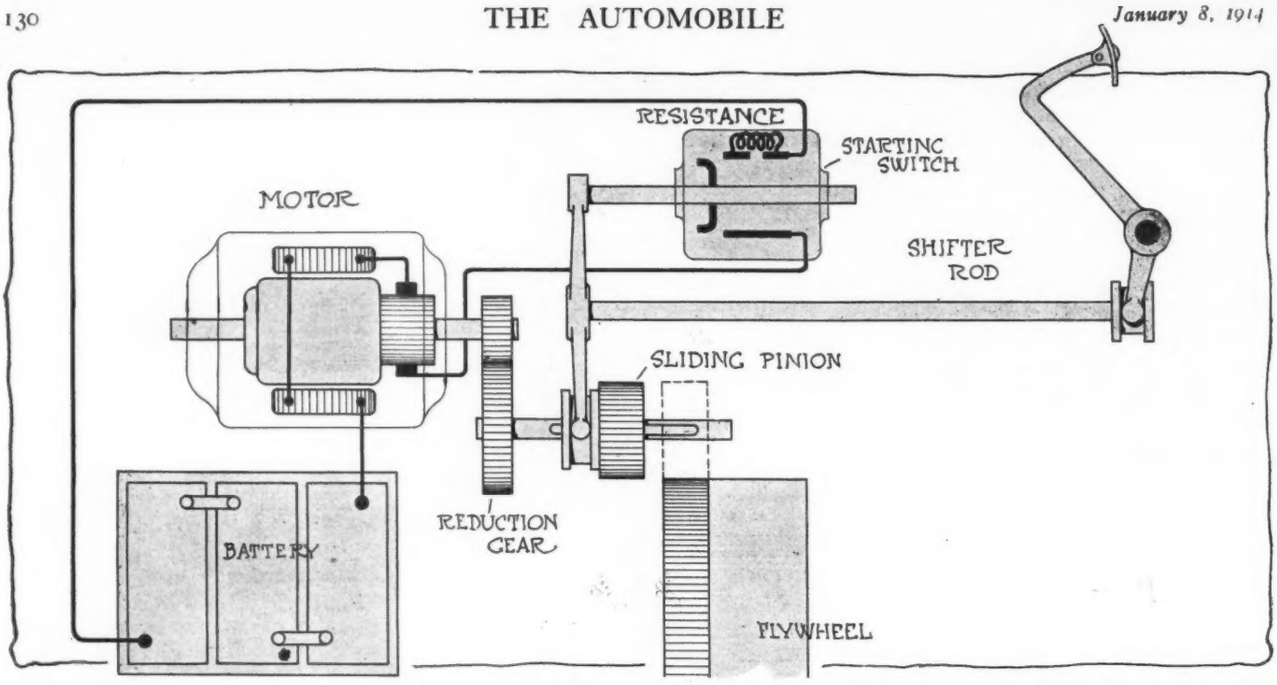


Fig. 3—Diagrammatic representation of the typical method of applying the electric starting motor to the flywheel of the engine through the use of a sliding pulley interconnected with the starting switch of the motor. Pressure on the pedal meshes the driving pinion and simultaneously starts the motor through a resistance. This resistance is cut out when the pedal is fully depressed

tually used on more than double the number of cars fitted with any other type. The general tendency is to incorporate in the end cover of the motor a first reduction gear of 2 or 3 to 1, including an over-running clutch, Fig. 4, in one of the gears, and obtaining a further reduction of roughly 8 up to 10 to 1 between the sliding pinion and the flywheel. A further detail that is common to most makes using the flywheel drive is to interconnect the pinion shifter mechanism with the switch, Fig. 3.

Switch Has Starting Resistance

This is one of the details in which the other methods can claim an advantage. In these the chain or other mechanical connection between motor and engine is continuously in mesh, the motor coming out of action only through the over-running clutch, and consequently it is only necessary to switch in the motor without further thought. The starting switch for the flywheel and sliding pinion method generally contains a resistance which is inserted on the first movement of the switch rod so that the motor turns comparatively slowly at first till the teeth are in engagement, and is finally cut out at the completion of the stroke of the pedal actuating the sliding pinion mechanism.

The over-running clutch, Fig. 4, used in the gear of both the flywheel applications and the crankshaft methods consists of a star shaped inner member capable of free rotation inside a toothed outer member. Hard steel rollers occupy the tapered space formed by the notches in the inner member and are of such a size that on the outer member being turned in one direction they bind between the two surfaces and transmit the drive but if the star shaped member is turned in the same direction the rollers simply pass round freely with it allowing the toothed ring to remain stationary.

The motor for flywheel drive may be fitted in front or behind the flywheel and above or below the center. Perhaps the commonest position is to mount it on the crankcase ledge immediately in front of the flywheel where it is accessible and convenient for attachment of the sliding pinion to the pedal on the footboard. A considerable saving in the weight and complication of operating gear is thus effected.

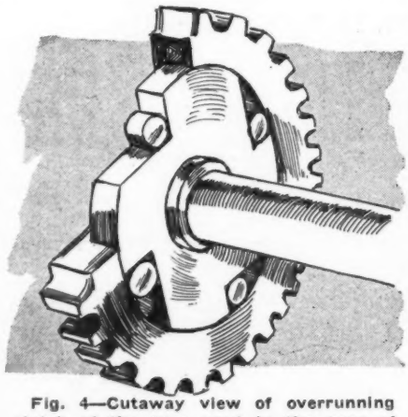


Fig. 4—Cutaway view of overrunning clutch of the type used in the gear of electric starters to prevent the engine back-driving the motor should the latter not be switched off immediately firing commences

In the other methods a chain is generally used, the over-running clutch being incorporated in the chain wheel on the crankshaft so that the chain remains idle except during the operation of starting.

The claims of the combined starter and lighter have been a source of much contention since the idea of combining the motor and generator in a single machine was first tried. In this type of single-unit electrical equipment the armature and field magnet is made to answer both purposes but in order to fit the electrical requirements it is inevitable that a certain loss of efficiency take place when the machine is operating in either capacity owing to the fact that it has also to be made to act in the other capacity.

Single-Unit Arguments

In the first place the combination is naturally larger than either one of the units of a separate motor and generator set and it is contended by the opponents of the single-unit idea that a considerable amount of power is wasted in the driving of a heavier armature all the time the car is running than is required in a separate generator, with its smaller armature. Then since the gear ratio between a starting motor and the engine to obtain the highest efficiency should be at least 18 to 1 whereas that most efficient between the engine and a generator need not be more than 2 or 3 to 1, a certain amount of gearing and the means of changing over from one to the other purpose is essential. This gearing is of course equally necessary in the separate motor and generator.

On the other side of the argument there is the very strong point that with separate units a complete motor with gear is being carried dead during the running of the car, to be available for the few minutes when starting.

A review of the starter field follows:

Review of the Starter Field

Aplco—Starter and Lighter

In the Aplco electric system the two functions of generating current for charging the battery and the motive power for starting the engine are combined in a single piece of apparatus. In conjunction with this a controller is fitted in front of the seat, the purpose of which is to make the necessary alteration in the connections from the 24-volt battery when using the equipment as a starter or generator. For this purpose the cells of the storage battery are divided into groups and these can be arranged in series or multiple, by certain positions of the controller lever. In starting the cells are arranged to supply a 24-volt current but when the engine is running the charging proceeds at a 6-volt rate.

The machine has a cylindrical casing and is designed for installation at the side of the motor, driving by gear, or chain, to the front end of the crankshaft.

Auto-Lite—Makes Two Types

The Auto-Lite Co. manufactures motors for front-end or flywheel drive. The flywheel driver is a cylindrical model 6.3 inches in diameter with two flat sides. A reduction gear consisting of a pinion on the armature shaft and an internally toothed gear is inclosed in a housing fitted to the end-cover. This first step provides for a reduction of about 2 to 1. This outer drive pinion, which is arranged for sliding into mesh with the flywheel, makes a further reduction of about 9 to 1 so that the total ratio between motor and crankshaft is about 18 to 1.

The starting switch is mounted adjacent to the shifter rod which operates the sliding pinion and is connected thereto so that the motor starts at the moment of meshing with the flywheel. An over-running clutch is fitted in the reduction gear. The terminals are carried through the casing at the end, leaving the sides clear for whatever method of attachment is suitable. A metal band surrounds the casing at the commutator end over inspection doors. This is easily removable when it is desired to examine the brush gear. The field winding is series, two of the four poles carrying coils.

The front-end starter of the same concern can be fitted to an old car with scarcely any alteration. The drive is by chain to the forward end of the crankshaft through an over-running clutch. A cast iron bracket integral with the casing is the means of attaching to the engine, and the motor can be removed almost as readily as a magneto.

Bijur—Square and Round Types

Two types of starters are made by the Bijur Co. both alike so far as the general electrical characteristics are concerned but which differ only in the shape of the magnet casing. One is a four-polar rectangular model and the other a cylindrical machine. Both are adapted for application to the flywheel of the engine but the necessary gearing and method of mounting is left to the car builder, the only stipulation being that whatever means is used for the operation of the sliding pinion which meshes with the flywheel, the starting switch be connected so as to operate simultaneously. The switch consists of a sliding member carrying a resistance at one end. In action two contact pieces to which this resistance is attached, first pass on to two brushes which form the main terminals of the switch and in doing so insert the resistance in the circuit. Further movement of the sliding member brings a laminated brush directly in contact with the two terminals thereby short-circuiting the resistance and allowing the full current to flow to the motor.

In the cylindrical model B, Fig. 5, the four poles are bolted into the steel casing and all carry field coils. In the rectangular model, although it is of the four-polar type also, only two of the poles, the upper and lower, are wound. This is on account of space considerations. It is desirable for adaptability to have a starting motor as narrow as possible to fit the sometimes confined spaces available about the motor. By eliminating the side coils a much narrower field casing is obtained.

One of the noticeable features of the cylindrical model is its clean external design. The end covers are simply flat disks and the field casing extends at the same diameter over the commutator. Holes are cut at this end to form inspection doors which are covered by a metal band provided with a snap clasp.

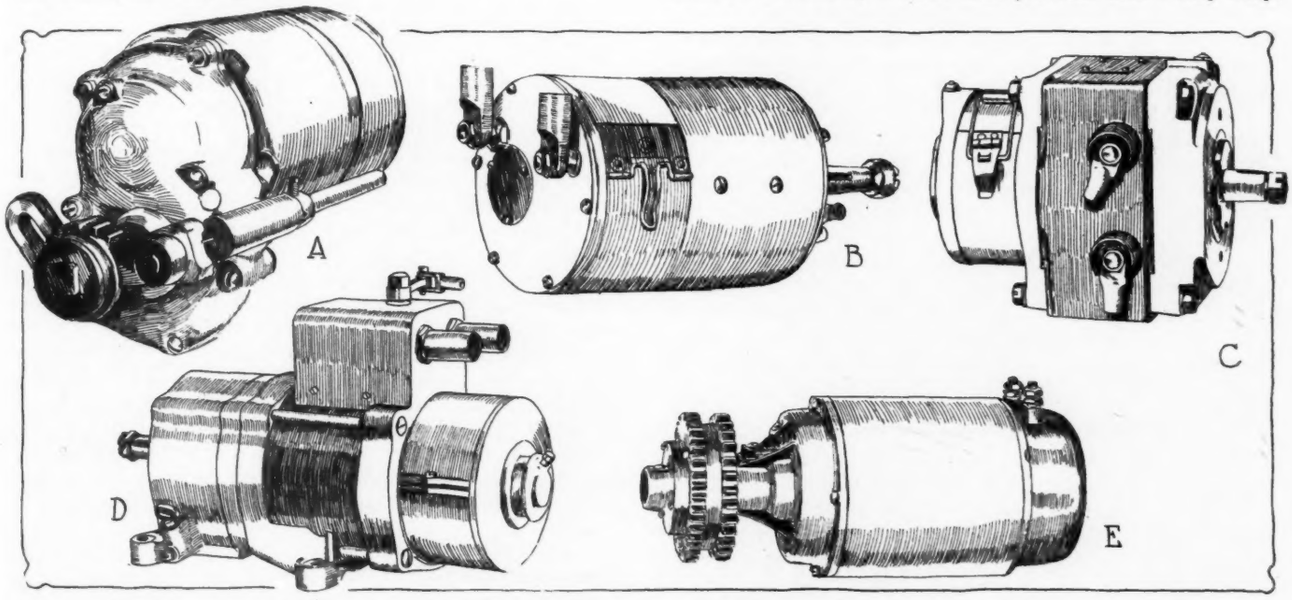


Fig. 5—Starting motors of various types: A, Ward Leonard starter with internal reduction gear and sliding pinion. B, Bijur cylindrical motor. C, Westinghouse square motor without reduction gear. D, Jesco combined starter and lighter. E, Gray & Davis motor with inclosed planetary gear and chain sprockets

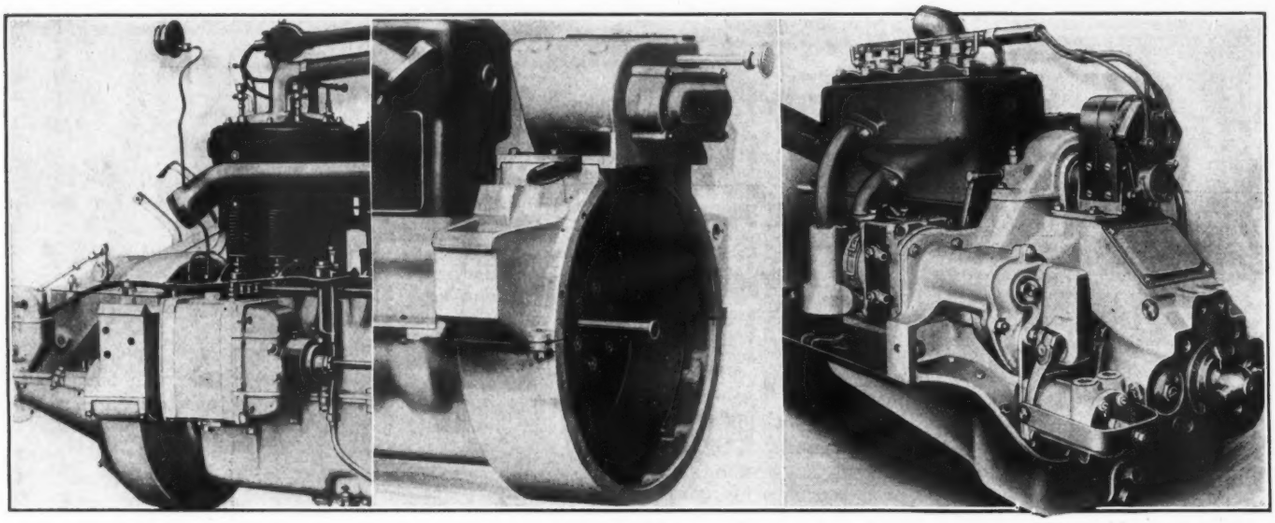


Fig. 6—Three flywheel-sliding pinion starting equipments: Left, Delco on Packard. Center, Gray & Davis motor on Pathfinder. Right, Westinghouse on Hupmobile

The terminals are brought out through the end cover instead of at the side and this also contributes to the smoothness of the exterior. Feet are not fitted as standard to the motor the idea being to allow any suitable method of mounting according to the peculiarities of the engine. A common method is the provision of a cradle conforming to the curvature of the magnet and a steel binding strap. The gear reduction ratio is generally from 17 to 1 up to 20 to 1 between the motor and engine. In the flywheel drive the first step of reduction should be about 2 to 1. Ball bearings are used for the armature shaft.

Deaco—Separate and Double-Deck

The Detroit Electric Appliance Co., in line with other makers, is producing both separate motors and double-deck units. In all Deaco models the casings are cylindrical and four-polar. The smallest model which is designed for application to the flywheel on the sliding pinion principle contains a reduction gear which is mounted in a housing on the end-cover. This gear provides a reduction of about 2 to 1 through the use of a pinion on the end of the armature shaft meshing with teeth internally cut in the outer member of an over-running roller clutch. This motor measures 5.5 inches in diameter by 7.25 inches long and weighs 29 pounds. It is intended for gearing with the flywheel at a ratio of about 9 to 1 so that the complete reduction ratio between motor and engine is in the neighborhood of 18 to 1.

The operation of the starter is by a small pedal on the foot board in connection with a shifter rod extending from the sliding-pinion housing. Simultaneously with this, movement is applied to the motor through the closing of a starting switch which first inserts a resistance in the circuit and finally connects direct.

The double-deck outfit consists of a generator and starting motor coupled by an end casing containing a double reduction gear. The motor itself is identical with the separate machine. This set also includes the usual over-running clutch which is mounted on the generator shaft so that the motor and reduction gear remain inactive except when starting the engine.

Delco—A Starting-Lighting Unit

The functions of starting and generating current to charge the battery are performed by the same machine in the Delco equipment. This dual apparatus, so far as the arrangement of magnet and armature is concerned, does not differ materially from general practice with the single-unit machine. The field magnet has two sets of winding however, as has also the armature, one set of each being used when the machine is acting as a motor and the other when it is generating current.

In one method of installation the motor-generator is designed for attachment to the engine at the side obtaining its drive from an extension of the camshaft, the armature turning at crankshaft speed when generating and when operating in the other capacity a sliding pinion meshes with teeth on the periphery of the flywheel and so starts the engine. Two over-running clutches are fitted in the gear mechanism, one being inserted in the drive between the engine and the armature shaft and the other in the reduction gear between the armature shaft and the sliding pinion. The first is necessary to allow the engine to run ahead of the drive and the second to permit the engine to speed up after starting without spinning the armature at a dangerous rate.

The poles of the magnet are bolted into the casing. The armature is provided with two commutators for the two windings. A reduction gear is contained in a housing at one end of the machine and the sliding pinion is operated at the same time as the starting switch. The total reduction ratio between the starter and the engine in the particular installation under consideration is about 25 to 1.

Disco—A Double-Deck Outfit

In the Disco double-deck outfit, instead of coupling two separate units, a single casting serves for both the motor and generator fields, but this is only to obtain a strong and compact construction. The magnetic circuits of both units are distinct, a wall in the casting separating them.

Both motor and generator fields are two-polar, the poles being square and integral with the casting. A double reduction including an over-running clutch is inclosed in a combined end-cover and in one method of application to the engine the equipment is located over the magneto shaft to which it is connected by chain.

The magnet casing is rectangular, but separate cylindrical extensions for the commutator end bearing are provided, so that inspection of either brush gear can be easily made. Electrically the construction follows standard practice. The armature laminations are stamped with lips to the slots and after winding, wood battens are forced in to hold the winding in place. By this method no binding wires are necessary. Flat copper is used for the field coils and there are four carbon brushes. In tests the starting motors have shown an efficiency of nearly 70 per cent. The company also makes separate motors and generators.

Entz—A Motor-Generator Unit

The Entz is an 18-volt combination motor and generator which may be mounted on a bracket at the left front end of the engine or in any other convenient place, and is permanently con-

PARTICULARS OF THE ELECTRIC STARTING EQUIPMENTS AS FITTED TO THE CARS OF 1914

Car and Model	Starter	Stock or Extra	Voltage	Speed, R.P.M.	Weight, Lbs.	Ratio	Drive	Battery
Abbott-Detroit 34-40	Auto-Lite	Stock	6	80	55	40:1	Gear to shaft	Willard-120
Abbott-Detroit 44-50	Auto-Lite	Stock	6	80	55	40:1	Gear to shaft	Willard-120
Abbott-Detroit 50-60	Auto-Lite	Stock	6	140	48	28:1	Flywheel	Willard-120
Allen 38 and 40	Auto-Lite	Stock	6	120	....	13:1	Flywheel	Willard-100
American (all models)	Disco	Stock	12	150	95	20:1	Timing gear	Willard-50
Apperson	Bijur	Stock	6	....	....	....	Chain	Willard-100
Buick 24 & 25	Delco	Stock	6	130	....	18:1	Flywheel	Exide 90
Buick 36 & 37	Delco	Stock	6	130	....	20:1	Flywheel	Exide 90
Buick 55	Delco	Stock	6	130	....	20:1	Flywheel	Exide 90
Cadillac	Delco	Stock	6	90	83	25:1	Flywheel	Exide-130
Cartercar 7	Delco	Stock	6	114	48	24:1	Flywheel	Exide-100
Cartercar 5	Jesco	Stock	8	72	72	24:1	Chain	Willard-80
Case 25	Westinghouse	Stock	6	110	....	25:1	Flywheel	Willard-*80
Case 35	Westinghouse	Stock	6	100	....	25:1	Chain	Willard-100
Case 40	Westinghouse	Stock	6	85	....	....	Chain	Willard-120
Chalmers 24	Entz-Chalmers	Stock	18	100	112	....	Chain	U.S.L.-50
Cole 14-4	Delco	Stock	6	80	120	25:1	Flywheel	Exide-80
Cole 14-6	Delco	Stock	6	80	120	25:1	Flywheel	Exide-80
Chandler	Westinghouse	Stock	6	90	....	15:1	Flywheel	Willard-80
Chevrolet	Auto-Lite	Extra	6	150	62	17:1	Gear to Shaft	Willard-100
Chevrolet	Auto-Lite	Stock	6	130	50	18:1	Flywheel	Willard-100
Chevrolet	Gray & Davis	Stock	6	110	52	24:1	Flywheel	Willard-100
Correja 4	Ward Leonard	Extra	6	90	....	30:1	Flywheel	Willard-100
Correja 6	Ward Leonard	Extra	6	100	....	20:1	Chain	Willard-100
Cunningham	North East	Stock	16	35	63	33:1	Chain	Willard-50
Dorris	Westinghouse	Stock	6	145	50	24:1	Flywheel	Willard-80
Edwards 25	U.S.L.	Stock	24	150	60	1:1	Direct	U.S.L.-100
F.I.A.T. 54, 55 & 56	Westinghouse	Extra	6	70	55	24:1	Flywheel	Willard-120
Franklin 6-30	Entz	Stock	18	150	....	44:17	Chain	Willard-35
Havers 6-44	North East	Stock	16	75	....	28:1	Chain	Willard-50
Havers 6-60	Gray & Davis	Stock	6	90	....	28:1	Chain	Willard-80
Haynes 26, 27 & 28	Leece-Neville	Stock	12	100	52	20:1	Flywheel	Willard-60
Henderson (all models)	Ward-Leonard	Stock	6	90	48	25:1	Flywheel	Willard-100
Herreshoff 4-30	Westinghouse	Stock	6	120	25	18:1	Flywheel	Willard-100
Herreshoff 6-40	Westinghouse	Stock	6	80	25	18:1	Flywheel	Willard-100
Hupmobile 32	Westinghouse	Extra	6	150	40	18:1	Flywheel	Willard-100
Hudson	Delco	....	....	90	....	....	Flywheel	.....
Jeffery 83 & 96-6	U.S.L.	Stock	24	250	....	1:1	Direct	U.S.L.-100
Jeffery 93-4	U.S.L.	Stock	12	250	....	1:1	Direct	U.S.L.-80
Jackson	Auto-Lite	....	6	....	....	....	....	Willard-120
King B	Ward Leonard	Extra	6	100	37	30:1	Flywheel	Willard-80
Kissel 40	....	Stock	6	100	74	16:1	Flywheel	Willard-120
Kissel 48-6 & 60-6	....	Stock	6	100	74	16:1	Flywheel	Exide-120
Kline	Rushmore	....	6	....	....	....	Flywheel	.....
Knox 46 & 66	Berdon	Stock	6	100	95	38:1	Flywheel	Willard-120
Knox 44	Berdon	Stock	6	80	95	38:1	Flywheel	Willard-120
Knox M-3	Rushmore	Stock	6	90	75	11:1	Flywheel	Willard-120
Keeton E	Jesco	Stock	6	125	53	....	Chain	Willard-100
Krit	Disco	....	6	138	....	16:1	Gear	Willard-80
Locomobile (all models)	Gray & Davis	Stock	6	80	78	20:1	Flywheel	Willard-120
Lozier 77	Gray & Davis	Stock	6	100	....	15:1	Flywheel	Willard-100
Lozier 84	Gray & Davis	Stock	6	100	....	30:1	Chain-transm'n	Willard-80
Lyons	North East	Stock	24	80	73	14:1	Chain	Willard-35
Marathon "Champion"	Apple	Stock	6	75	....	1:1	Chain	Willard-100
Marathon "Winner"	Jesco	Stock	6	100	....	2:1	Chain	Willard-100
Marion G	Westinghouse	Stock	6	100	95	18:1	Chain	Willard-120
Marion B	Westinghouse	Stock	6	100	95	15:1	Flywheel	Willard-120
Marmon	North East	....	....	....	....	40:1	Chain	.....
Metz	North East	....	....	....	....	....	....	.....
Moline	Wagner	....	12	120	....	....	Flywheel	Willard-80
Monarch	Deaco	Stock	6	125	150	8:1	Flywheel	National Carbon Co-80
Moon 6-50	Delco	Stock	6	100	....	22:1	Flywheel	Exide-120
Moon 42	Delco	Stock	6	120	....	27:1	Flywheel	Exide-120
Mason L	Jesco	Extra	6	80	70	3:1	Chain	Willard-120
Maxwell 35	Deaco	Extra	6	125	....	18:1	Flywheel	Willard-100
Maxwell 50-6	Gray & Davis	Stock	6	95	58	17:1	Flywheel	Willard-100
Mercer	Rushmore	Stock	6	160	....	5:1	Flywheel	Willard-120
Mitchell	Remy	Stock	6	75	80	25:1	Gear-transm'n	Gould-120
Norwalk C & D	Westinghouse	Stock	6	75	62	28:1	Flywheel	Willard-100
National	Gray & Davis	Stock	6	....	....	....	Flywheel	.....
Oldsmobile 54	Delco	Stock	6	100	....	25:1	Flywheel	Exide-120
Oakland 36	Delco	Stock	6	105	55	20:1	Flywheel	Exide-120
Oakland 43, 48 & 62	Delco	Stock	6	90	70	20:1	Flywheel	Exide-150
Overland 79	Gray & Davis	Extra	6	125	80	28:1	Chain	Willard-80
Paige-Detroit 36	Gray & Davis	Stock	6	105	....	15:1	Flywheel	Willard-90
Pathfinder 4-40	Gray & Davis	Stock	6	100	90	15:1	Flywheel	Willard-120
Pathfinder 6-68	Gray & Davis	Stock	6	100	90	15:1	Chain	Willard-120
Packard 2-38	Bijur	Stock	6	100	....	20:1	Flywheel	Willard-120
Pierce-Arrow	Westinghouse	Stock	6	....	....	....	Flywheel	Exide-
Peerless 6-38, 48	Gray & Davis	Stock	6	90	86	22:1	Flywheel	Willard-120
Peerless 6-60	Gray & Davis	Stock	6	60	86	30:1	Flywheel	Willard-120
Palmer-Singer K	Westinghouse	Stock	6	80	....	30:1	Flywheel	Willard-100
Regal (all models)	Rushmore	Stock	6	110	60	8:1	Flywheel	Willard-100
Reo 5	Remy	Stock	6	125	62	15:1	Worm gear	Willard-100
Republic E	Delco	Stock	6	....	150	31:1	Flywheel	Exide-120
S. G. V.	U.S.L.	Stock	24	....	....	1:1	Direct	Willard-100
Simplex (all models)	Rushmore	Stock	6	100	30	12:1	Flywheel	Willard-120
Speedwell H	Wagner	Stock	12	70	88	15:1	Chain	Willard-100
Stearns-Knight 4	Gray & Davis	Stock	6	60	55	25:1	Flywheel	Willard-80
Stearns-Knight 6	Gray & Davis	Stock	6	50	65	27:1	Flywheel	Willard-120
Studebaker (all models)	Wagner	Stock	6	....	....	20:1	Chain	Willard
Stutz E	Remy	Stock	6	90	62	16:1	Flywheel	Willard-120

NOTE.—This table is not quite complete but contains all obtainable information. The weight shown is that of the starting motor with necessary gears between it and the engine. The word "Chain" in the drive column means that chain is employed in addition to the other reduction gear which is always present.

nected to the crankshaft by a silent chain. The outside dimensions of the motor generator are 13.5 inches by 9.75 by 7 inches and the weight 100 pounds. It is geared to run at two and one-half to three times the speed of the crankshaft. The electrical connection between the battery and the motor-generator is made by means of a knife edge switch, located on the dash. Closing the switch causes the current to pass from the battery to the motor-generator, if the latter is stationary, thus starting the engine. As soon as the engine reaches a speed when the generator current is of the correct voltage charging of the battery automatically commences.

Gray & Davis—High and Low Speed

The starting motors of the Gray & Davis Co. E, Fig. 5, are made in three sizes, a low speed model and medium and high-speed models. All are cylindrical in shape and are supplied with

or without reduction gear. An unusual feature of some of the models is that the reduction gear is of the planetary type, this being used for its compactness. The reduction is single, that is, only two toothed members are in mesh. The inner one is carried on an eccentric keyed to the armature shaft and its teeth engage continuously at a varying point with the internally toothed second member. The whole gear is easily contained in an end-cover the same diameter as the magnet casing.

The magnet casing is a steel casting and the poles are built up from laminations. The winding in all models is straight series, and carbon composition brushes are used.

In fitting the motor for flywheel drive a two point switch is interconnected with the shifting mechanism of the sliding pinion in its first position, the motor circuit is closed through a resistance contained in the switch casing, allowing meshing to take place quietly. The second position cuts out the starting resistance and the full torque of the motor is applied. The three sizes of motors are made to suit reduction ratios with the engine of 15 to 1, 26 to 1, and 36 to 1. The high speed model weighs 31 pounds and the low speed model 45 pounds without the reduction gear. All are for operation on a 6-volt circuit.

A typical installation is the mounting of the motor on the crankcase ledge immediately in front of the flywheel with the generator at the opposite end of the engine obtaining its drive from the front end. But in case where these spaces are not available a duplex design in which the motor is mounted over the generator is provided. In this combination the two units are connected by inclosed chain.

The casing for the chain is not integral with the end-covers of the units as is often the case in combined sets but is a separate casting. By this construction the entire motor and generator are complete standard machines as supplied separately.

Hartford—Uses Small Flywheel

In the Hartford starting system, Fig. 8, designed for drive by chain to the crankshaft, use is made of a flywheel on the armature shaft. A friction clutch is provided between the motor and the train of gear and in operation the motor is first speeded up and then the clutch is put into action so that the energy of the rapidly spinning flywheel is made to contribute to the starting torque necessary to overcome the standing engine.

The motor itself is a cylindrical design having two poles with wide faces bolted into the casing. The casing is mounted on a base which has an extension consisting of a gearcase containing a worm gear reduction. The flywheel occupies a position between the motor and the reduction gear and the clutch is arranged inside the flywheel. Operation of the clutch is by a rod passing through the hollow worm shaft. This rod is operated by means of a lever projecting from a starting switch fitted on top of the gear case, the switch making contact simultaneously with the closing of the clutch faces. The drive from the worm wheel shaft is by chain to the crankshaft, an over-running clutch being fitted in the chain wheel on the crankshaft.

The flywheel weighs 5 pounds and the drive ratio between the worm and the intermediate shaft is about 25 to 1. From this shaft to the crankshaft a further reduction of about 3 to 1 is used, making a total reduction ratio of about 75 to 1.

Jesco—Combines Starting and Lighting

A single machine answers for both starting and lighting in the Jesco equipment D, Fig. 5. This is made in two sizes of substantially the same construction except that the larger model has a square casing while the magnet of the smaller machine is cylindrical. Steel laminations are used for the magnet casings of both models. The four poles in each size are punched integral with the casing and all four poles carry windings. The end-covers of aluminum alloy are bolted up by through bolts passing the entire length of the motor. A reduction gear of the planetary type is inclosed in one of the end-covers. This is made up in various ratios. In the smaller model 8 to 1 is standard and this in conjunction with a 3 to 1 final reduction by chain to the crankshaft affords a total ratio between motor and engine of 24 to 1. Two ratios of 8 to 1 and 16 to 1 are provided for the larger size machine. The first is intended for a 3 to 1 final reduction and the second for a 2 to 1 final reduction. When the machine is operating as a generator the planetary is out of action and the armature then runs at the speed represented by the chain drive. The change from solid drive to gear is made automatically.

The starting switch of the new models is mounted on top of the motor in a casing which also contains the regulator and cut-out for the generator circuit. The switch is a laminated brush swiveled on a pillar and provided with an external crank for lever connection to pedal or other means of operating.

Field excitation is by series windings when the machine is acting in the motor capacity. When generating a compound winding, one part of which acts on the bucking principle, is in use. The armature carries two windings and a double commutator.

Leece-Neville—Has Laminated Field

This year the Leece-Neville starting motor shows an improvement over last year in the matter of accessibility of the brush-gear. Last year's model used two carbon brushes spaced 180 degrees apart, one at the top of the commutator and the other beneath. The consequence was that when inspection was necessary or new brushes were required the lower brush was difficult of access. This year the brushes are arranged at 90 degrees, and both being in the upper half of the end casing are easily accessible.

The magnet frame is unusual in that it is built up from laminations instead of being a casting. The external shape is rec-

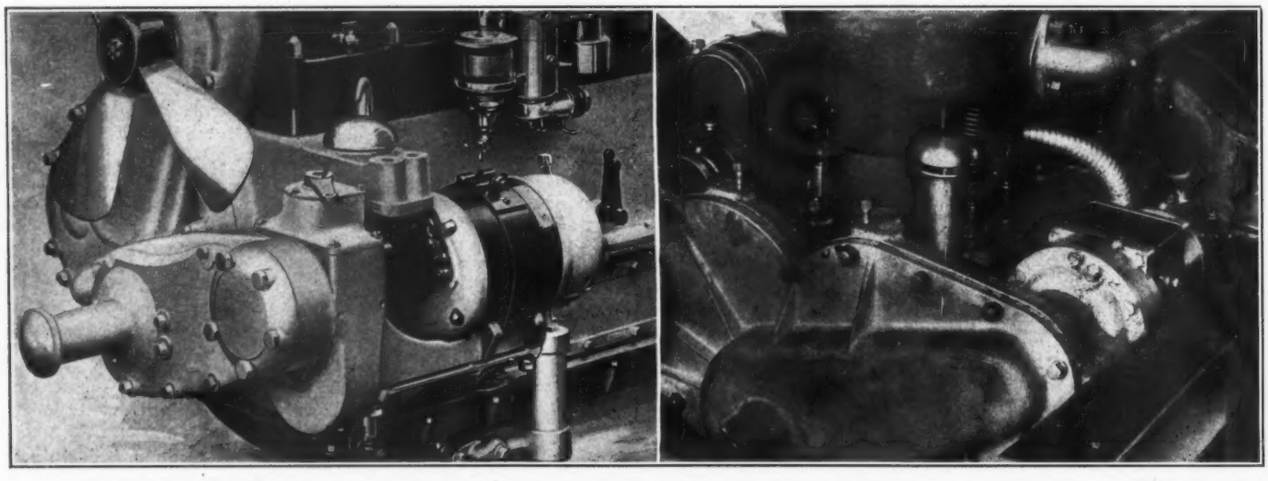


Fig. 7—Front end applications of starters: Left, North East combined unit on Lyons-Knight. Right, Westinghouse motor on Case

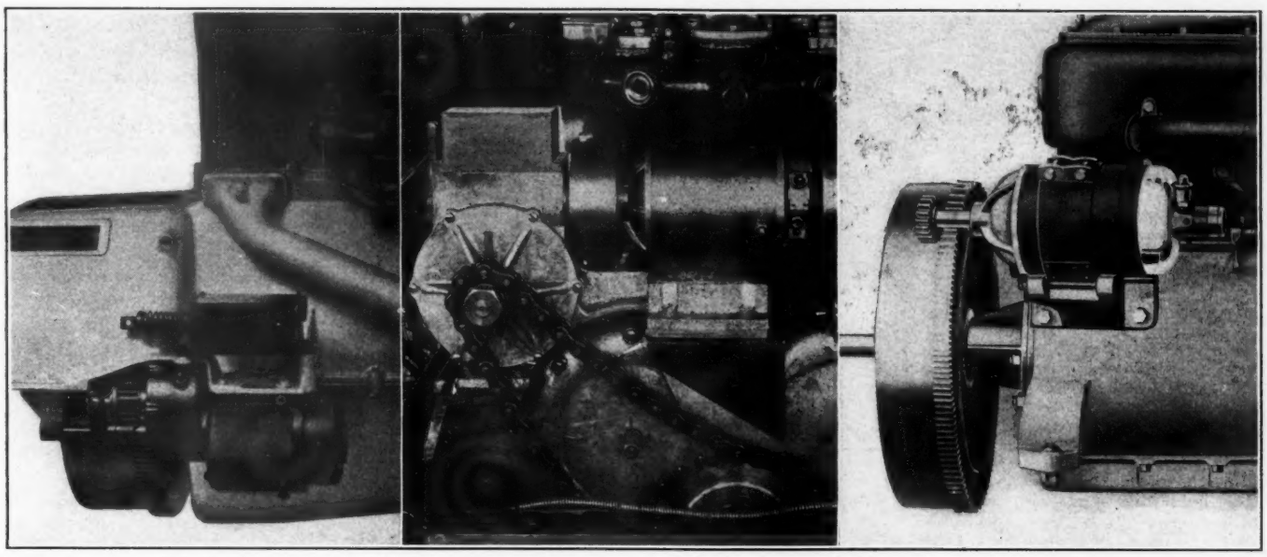


Fig. 8—Left, underneath position of Wagner starter on Moline Knight with switch immediately above. Center, front end installation of Hartford motor which drives through worm and chain, using the momentum of small flywheel. Right, application of Rushmore starter direct to flywheel of Regal

tangular, the two poles being located top and bottom. The end-covers completely inclose the machine. The armature shaft runs on ball bearings.

As fitted to the Haynes car the motor is mounted on a bracket cast integral with the crankcase and is geared to the flywheel through a sliding pinion. The total gear reduction is about 20 to 1. The motor is operated by pressing a button on the control board at the head of the steering pillar. This energizes a solenoid which makes a positive mechanical connection between the clutch pedal and the shifter rod of the sliding pinion. Pressure on the clutch pedal then switches in the motor and almost immediately after meshes the gear. The voltage for which the motor is designed is 12.

National—Drives by Sliding Worm

A starter which differs from the general line is that produced by the National Coil Co., which is applied behind the clutch and in front of the transmission, occupying a transverse position on the chassis. The peculiarity of the drive is that a single reduction, obtained through a sliding worm is used. A worm wheel is fitted rigidly to the clutch shaft and the single thread worm on the motor shaft above is provided with mechanism connected to the starting pedal, for sliding it into mesh simultaneously with the starting switch. A resistance is inserted in the motor circuit on starting to ease the engagement of the worm gear. A safe disengagement is insured, it is claimed, by the automatic throwing-out action of the worm wheel itself, augmented by a return spring on the shaft, as soon as the engine picks up and the drive is changed over from the worm to the worm wheel, but this is only in the case of the operator not withdrawing the starting pedal. The motor is a four-pole, laminated field cylindrical machine.

North East—A Combined Design

Generating and starting is performed by the same machine, Fig. 9, in the North East system. The motor-generator is a cylindrical model and differs from many compound machines in having only one commutator and set of brushes to act in both capacities. In one model it is mounted at the side of the engine and drives through a reduction gear and chain to the crankshaft. A change-speed is arranged in the gear box by which the armature can be connected in two different gear ratios to the engine. In the motor position the ratio between the armature and the crankshaft is arranged from 10 to 1 to 18 to 1 while in the other position when the car is running and current is required for charging the battery the speed is cut down to 2 or 2.5 to 1. This ratio is obtained by the chain and thus the inclosed gear is simply cut out for generator purposes and inserted for starting. The change is effected by the use of a clutch and the sequence of operations are as follows: The starting switch lever on its first movement engages the gears through the clutch and immediately afterwards the current is shunted around the reverse current cut-out thereby starting the motor-generator operating, the drive being transmitted from the outer end of the reduction gear by chain to the crankshaft.

Remy—Shows Four Models

The line of electric starting motors for 1914 by the Remy Electric Company comprises three sizes of cylindrical four-pole totally inclosed models and a combination starting motor and generator double-deck set.

The overall sizes of the smallest model are 5.75 inches diameter by 8.5 inches long, of the medium size motor, 6.75 inches diameter by the same length and of the largest size 7 inches diameter by 8 inches long.

In the double-deck design the magnet is a single casting with a dividing wall between the two fields. The motor occupies the upper position and has four poles cast integral with the casing. The generator, below, is of the bipolar type. The reduction gear is inclosed in a casing at one end and provides for a reduction between the motor shaft and the generator shaft of about 15 to 1. An over-running clutch is fitted in the largest gear on the generator shaft. This double-deck model is rectangular and measures 8.5 inches high by 12 inches long and 5.5 inches wide. It may be driven by gear or chain at crankshaft speed to twice crankshaft speed. All models are for operating at 6 volts.

Rushmore—Drives Direct

The Rushmore starter, Fig. 8, is designed for application to the engine flywheel by a sliding mesh but differs from other flywheel equipments in that the pinion is keyed solidly to the armature shaft and slides with it. No intermediate gears are used and the action of sliding the pinion into engagement with the teeth on the periphery of the flywheel is produced electrically so that no mechanical operation of pedal or lever is necessary when starting.

The sliding action of the armature is effected by displacing it from the magnet field, Fig. 10, through the agency of a spring contained in the hollow armature shaft. On switching in the motor the current passing around the field coils produces a

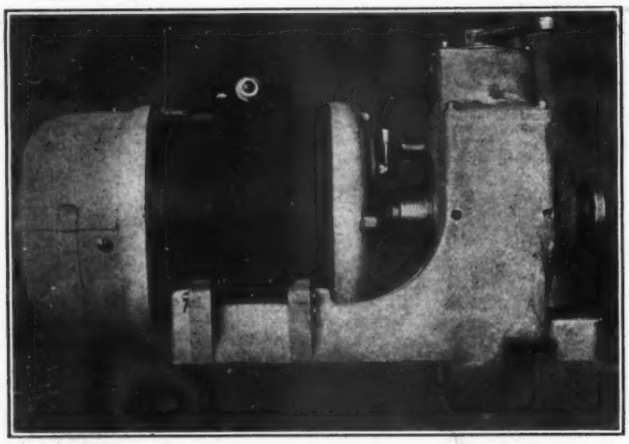


Fig. 9—North East starting motor mounted on base with inclosed reduction gear and interconnected starting switch above

strong magnetic attraction which draws the armature into the field and with it the driving pinion on the end of the shaft into mesh with the flywheel. After starting, the danger of burning up the conductor that would otherwise follow a too rapid spinning of the armature if the pinion remained in mesh with the flywheel is obviated by a correct proportioning of the return spring and the windings of the field magnet. This is such that unless the motor is exerting considerable torque, the field is not sufficiently strong to hold the armature up in the operating position.

U. S. L.—Is Integral With Flywheel

Constructionally the U. S. L. starter differs from all other types. It consists of a large diameter motor-generator the rotating member of which is utilized as flywheel mass for the gasoline engine, being connected permanently to the crankshaft in the place usually occupied by the plain flywheel. When the car is running, current is taken from the combination machine for charging the battery. When standing the same windings energize the field and armature for starting purposes. The voltage is higher than usual, 24 volts being used.

Ward Leonard—Variety of Types

To provide for a wide range of adaptability the electric starter produced by the Ward Leonard Co. are in three general types: 1, the separate starter with internal reduction gear contained in the end-cover and a sliding pinion A, Fig. 5, for meshing with the flywheel; 2, a double deck outfit in which the motor is mounted above the generator with the gear casing at one end connecting the two units; 3, a tandem outfit in which the generator and motor are mounted on a base end to end connected by a reduction gear case.

Numbers 1 and 2 of these three types are intended for drive by chain or gear to the crankshaft or magneto shaft. Only one drive pinion is fitted to these models, this taking the drive necessary for generator and in addition transmitting the power from the starting motor to the engine when starting.

In the tandem outfit which is the latest product of the company the gears inserted between the two units provide a reduction of 10 to 1. An over-running clutch is fitted so that when the car is running the starting motor and gears are entirely out of action. When using the starting motor the drive is transmitted through the over-running clutch and the armature shaft of the generator and a rotation of both armatures continues until the engine commences to fire and the speed of the generator runs up and puts the clutch out of action.

In the double-deck equipment exactly the same gear features are used except that they are contained at one end. The reduction here is double, an intermediate shaft occupying a position between the motor and generator shaft carrying a pinion which meshes with the outer member of the over-running clutch. The lower part of the reduction gearcase is provided with stuffing boxes at the generator shaft, so that the gears and roller clutch can be immersed in lubricating oil.

The separate motor with the sliding gear for application to the engine flywheel necessitates the use of a two-point switch which will allow easy meshing. In the Ward Leonard system this switch is arranged to operate in conjunction with the sliding pinion so that on the first movement of the operating member, pedal or lever, the motor is switched into the circuit through a chrome ribbon resistance in the switch casing until it is turning at a speed that renders meshing easy. Further movement of the pedal cuts off the current momentarily just as the pinion slides into the flywheel teeth and in the final position the current is again switched on full without the resistance.

Since the gear or chain connection between the engine and the combined unit models is never out of mesh, there is no necessity for a starting resistance for these equipments. Instead, a simple switch is included in the circuit which cuts the motor in or out directly.

Wagner—Separate Motor Design

The Wagner starting motor is a four-polar cylindrical design with a cast steel casing into which the poles are bolted. In the Studebaker equipment the motor is fitted to the side of the crankcase and drives through gears and chain to the front end of the crankshaft. An over-running clutch is incorporated in the chain wheel on the crankshaft. The motor is designed for a 6-volt circuit. Ball bearings are used for the armature shaft.

Westinghouse—Compact Motor Design

The Westinghouse starting motors C, Fig. 5, are rectangular machines having four poles but only the upper and lower ones wound. They are supplied either with or without reduction gear in the end-cover. The shaft runs on ball bearings and provision is made for adjustment. The gear connecting the motor to the engine is left to the car builder. In the flywheel-sliding pinion type the means of meshing the pinion includes also the operation of the starting switch in the following sequence of connections: The first movement of the pedal switches in the motor through a resistance contained in the switch casing. Then the contact brush of the switch passes through a neutral point, momentarily shutting off the current at the instant the pinion slides into mesh. The final position, when the pedal is fully depressed, again switches in the motor, this time directly across the mains without the resistance, and the pinion being then in full engagement the motor exerts the torque necessary for starting the engine,

When fitted with inclosed gear reduction the motor is generally connected to the crankshaft by chain or gear. The smallest model for flywheel attachment weighs only 18 pounds. In one of the larger models the planetary principle of gear reduction is used.

The commutator end-cover is surrounded by a metal band with a snap clasp that renders inspection of the brush gear a simple matter.

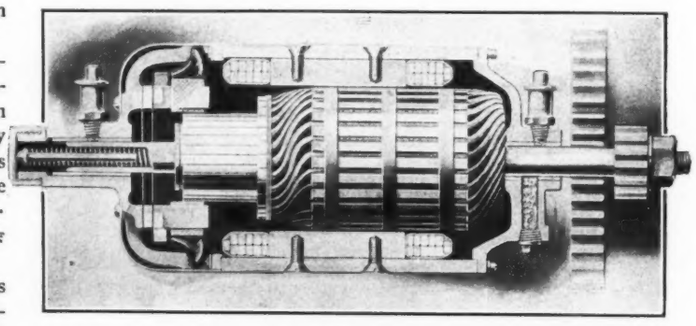


Fig. 10—Sectional view of the Rushmore starting motor, showing the sliding pinion out of mesh and the armature displaced

The Engineering Digest

Impressions Received from the Reading of Technical European Journals for Several Years

AMERICAN AUTOMOBILES IN THE WORLD MARKETS

DURING the past year a remarkable change has come over the technical press of Europe so far as its attitude to the American automobile industry is concerned. There is little left of the condescension with which the general design, the lines and the construction details of American cars were formerly mentioned. Not that approval has taken the place of indifference with regard to our sometimes unesthetic mechanical details or that the average European engineer admits for a moment that the average American car comes within three years of reflecting the most up-to-date understanding of the more knotty problems in automobile engineering, but there has been an upheaval in the estimate among European automobile manufacturers of what these factors amount to for the purpose of securing the trade of the large middle classes to whose valuable patronage they have heretofore catered almost in vain, and this new estimate, according to which pretty mechanics and finesses in scholarly engineering recede into the background in favor of more conspicuous and practical considerations, has been communicated to their more or less unwilling engineers who had come to their tasks in the automobile industry saturated with the traditions of their profession and for year after year had been permitted to shape the making of automobiles in close accordance with these traditions, including, as they did, a very considerable latitude for the skilled mechanic to work out minor details on the plan which is often summarized in the word "workmanlike."

To accomplish a roundabout-face from one ideal in construction to another has been the painful necessity forced upon European producers through the evident practical success of American methods; through the manifest liking of the middle-class European trade for American cars, their prices and all else considered. To discard the car which cannot be built without the faithful and expert co-operation of fifty trained mechanical specialists, and which in the long run cannot be kept in good order without much assistance from the same class, to discard as useless and misleading the working-pride involved in the daily efforts of these fifty, and to learn to look upon that car as the ideal, instead, which once it has been built and tested laboriously by five super-workmen, of mental and manual skill superlative, can be reproduced in large number through almost automatic mechanical machine operations—this change in attitude could not be accomplished easily; for it did not mainly mean the old story of buying more machinery to take the place of handwork but first of all a thorough and predetermined subordination of the design to the production possibilities and, secondly, the overcoming of the enormous and stubborn resistance by which skilled workmen will meet a general lowering in the grade of the work assigned to them. The difficulties were deeply rooted, and continue to be so, in the whole social and political status of European industry, which has no legions of unskilled workers coming to its assistance in a constant stream of immigration from foreign countries to be lifted gradually to the benefits of a higher wage scale than that to which they have been accustomed. It has been necessary to meet the difficulties with the utmost circumspection and to depart in many ways from all mere imitation of American methods. Yet the study of production methods has necessarily formed the backbone of the movement so falteringly inaugurated, and it is this element in the change which during the past year has been dominantly reflected in the technical press of Europe and has caused original descriptive articles relating to technical details of any other nature to become scarce and perfunctory, admittedly of secondary importance, while reprints and revampings of articles from American periodicals, especially those devoted to shop practice, are getting correspondingly numerous and are selected with a hungry promiscuity apparently denoting a set purpose.

In this reversed situation, America has almost ceased to borrow ideas from Europe, and Europe is borrowing all it can from American commercial policy and industrial production methods while yet determined to maintain the prestige of her *de luxe* industry with her own people and eventually to beat the Yankees on their own lines. A similar but much less complicated movement in art circles illustrates the situation. In art, those painters whose work can be reproduced in color prints without losing too much of the color effect make by far the largest incomes for themselves—other things equal—and thus a close study of color printing and its mechanical resources has become the most valuable adjunct to artistic inspiration and training. "But," says the old school, "you cannot paint artistically with a constant reference to color print possibilities in your mind; what you will do then is to paint chromos in the first place." The new school, preferring to prosper and also to see art democratized, answers: "Try it; you certainly cannot do it until you have tried; you cannot try unless you first study the possibilities. The thing is being done."

With reference to this simile, Europe seems at present inclined to maintain that America has seen a general truth and has acted upon it but that it was automobile chromos which America designed so as to be able to build them at all and to sell them at chromo prices, and that Europe, on the other hand, will manage to design on a higher plane and yet be able to produce lifelike counterparts by chromo methods, modified and improved.

Abolition of Fitting Misunderstood

It is not being overlooked that there is something more to account for American success than jigs, special machines for special jobs and designing with sharp reference to the cost of production. In the eyes of most of the technical writers of France and England, these factors are not yet fully accepted, except as affording an explanation of cheapness. Only the most advanced camp of builders in Germany seems to realize completely that the total abolishment of fitting of parts in the assembling rooms, and at any previous stage, is a high ideal to be striven for and not a fault to be tolerated for the sake of economy. Nowhere else, not even in the United States, are the means for attaining final accuracy cheaply by one machine tool operation being studied so closely, neither is the study resulting anywhere else in so many rapid and special measuring instruments and *"Normalien"* (unadjustable calipers for special jobs), gear testing machines and methods for heat treatment by which distortions may be avoided. The British press, though the complete interchangeability of parts has been drastically proclaimed an indispensable virtue and the only conceivable basis for a rational repair system—repairing by replacement exclusively—is not yet ready to admit that the manual skill employed

for fitting one part to another, or for tooling a part for the automatic production of which no machine has been devised, is no more admissible for high-priced than for low-priced cars and is now something to be ashamed of, outside of the experimental department, the pattern shop and the making of special jigs and measuring apparatus.

Also in France the glory of *la belle mécanique* is still honored, though there are strong voices in her automobile press which shout for confining it to harmless channels and developing, instead, the kind of mechanics and engineering by which the largest number of people can be served with a new luxury; the automobile, in all its grades of quality and prices.

Common Sense Rewarded

The other features in large American production which are now being widely acknowledged as worthy of emulation and therefore of close study are those by which American exporters made their first impression on foreign markets. The practice of selling complete cars, relieving purchasers of seeking out a carriage manufacturer to build a special body, has not been adopted as eagerly as might have been expected. Habits and class traditions were against it. But a considerable number of car manufacturers in all the European countries have after all found it necessary to adopt it. The much more recent practice of furnishing a complete equipment of accessories, included in the normal selling price of the vehicle, has been much more spontaneously appreciated. The almost universal use of four-cylinder motors for even the smallest cars is due to American example, but the European press does not acknowledge this fact openly, and the engineers are going to great lengths to produce a type of very small four-cylinder motor which will combine fuel economy with a considerable reserve power obtained through very high motor speed and much reduced vehicle weight. It cannot yet be said that their fond hope of overcoming American competition in small cars by this highly technical method is likely to be realized, as the wearing qualities of the ultra-speedy motor, turned out at a necessarily low cost of production, are still uncertain and all who are distrustful of this method, in America and elsewhere, are free to adopt as much of the progress identified with ultra-speedy motors as they consider safe. The widespread search for cheaper fuels, by which benzol, for example, has already been established as intrinsically a better fuel than gasoline (though not so in motors built for gasoline), and a certain popular objection to miniature vehicles, are also factors which array themselves in favor of the lines of design followed by American producers; all of which is now being discerned more or less distinctly by the technical European press.

Portentous New Accessories

But for this increasing willingness to admit that American "bluff" is plentifully tempered with a well-balanced common sense and sure enough of itself to await calmly, as a rule, the practical perfecting of even the most self-sure technical progress before incorporating it in routine manufacture, the almost abrupt and headlong adoption by the American industry of electric lighting and motor starters, to say nothing yet of gear shifters, might not have caused the consternation among European competitors which has found cautious expression in the pages of their automobile journals during the past year, and especially the past half-year. This movement which seems to be steering for the eventual development of the oft-tried gas-electric type of vehicle, while proceeding toward this logical end by new and very safe means of transition, is now practically flabbergasting the technical world with its possibilities. Not only the transmission but the very nature of motor and fuel are involved.

Altogether, America is leading and is to a certain extent admitted to be leading, and it is only a slight penalty for having advanced to this position that we cannot at present receive as much inspiration or information from the European technical press as formerly was placed at our disposal.

Calculation of Piston Displacement with Offset Crankshaft

OFFSETTING of the crankshaft with relation to the vertical plane through the axes of the cylinders results in a slight increase of the cylinder volume, in so far as the piston has to descend a little more deeply in the cylinder than ordinarily would be required, in order to have the connection-rod reach the low center on the crank circle. If the offset were as large for the upper center, this effect would not occur; the connecting-rod would have to be a trifle longer, for the same height of motor, but the stroke would still be equal to the diameter of the crank circle, but the piston displacement and cylinder volume would not be affected. In the case of cars entered for races subject to a strict limit of the piston displacement, if the enlargement of the stroke resulting from offsetting escapes consideration by the designer and he also tries to bring the motor as close as possible to the cylinder volume or piston displacement limits prescribed in the regulations, the result is likely to be the disqualification of the car equipped with such a motor. As the next *grand prix* race in France will be of the kind referred to—and the more important races at Indianapolis likewise—inquiries have been made for a formula from which the exact influence of offsetting on the length of the stroke may be calculated and answers have appeared in *L'Auto* of December 3 as well as in *Technique Automobile et Aérienne* for November 15. As the high piston speeds which will be employed in all the racing car motors—of necessity, since fuel economy is an object—renders an offset equal to one-fourth of the crank circle radius the maximum which could be contemplated, the actual lengthening of stroke which may take place is quite small. It amounts to less than one-half of one millimeter, but so much greater would be the disappointment if this small difference were to result in the disqualification of any racing entry, none too numerous as the bona fide racing entries now usually are.

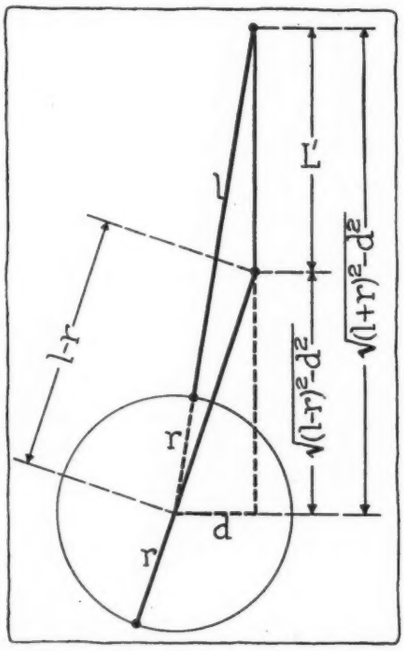


Fig. 1—Geometrical relations of piston stroke in offset motors

In practice the simplest formula is probably the one which can be taken directly from the accompanying diagram, Fig. 1, where the stroke L^1 in the offset motor is seen to equal the difference in the lengths of two catheti of right-angled triangles. Taking r as the length of the crankarm, d as the offset and l as the length of the connecting-rod, this formula becomes:

$$L^1 = \sqrt{(l+r)^2 - d^2} - \sqrt{(l-r)^2 - d^2}$$

Pol Ravigneaux in *La Tecnique* works it out to the simpler form:

$$L^1 = L\left(1 + \frac{k^2}{2(K^2-1)}\right) \quad \text{or} \quad L^1 - L = \frac{Lk^2}{2(K^2-1)},$$

in which L is the stroke of the corresponding motor designed without offset and therefore equal to $2r$, k is the proportion be-

tween the offset and the crankarm length $= d/r$, and K the proportion between the length of the connecting-rod and that of the crankarm $= d/r$. But this simpler form, though it shows the lengthening of the stroke at first glance, is obtained by ignoring certain minor factors and is therefore only approximately correct.

—

Jarnac Two-Jet Horizontal Carbureter for Block Motors

NEARLY all carbureters are being remodeled for attachment to block-cast motors with internal intake manifold and induction tubes, and the external characteristic of the new models is the approximately horizontal direction of the much shortened pipe containing the throttle. The bolting of this pipe directly to the motor casting results in a conveniently high position of the carbureter, to which there can be no objection if the fuel feed is by pressure instead of by gravity, and in greater facility for heating the air and keeping the carbureter warm while the motor is stopped or running light in cold weather. These improvements in carburetion are thus direct upshots of block-casting and pressure feed.

An interesting model of this type is the horizontal Jarnac made by Grouvelle & Arquembourg. The two jets are operated independently, the small one for running light and the larger one for all other conditions. They are parallel and function on the same principle, but their carburetion chambers are different and of different diameters. When the throttle barrel is turned off, an interior conduit through the body of it comes to register with the chamber of the small jet. The air regulation is provided as in older carbureters of the same make by means of a single valve body in which a number of holes closed by steel balls of different weights and diameters are raised and admit air in proportion to the suction. The main tube of the carbureter has a slight downward inclination to the motor, and this feature in connection with the manner in which the throttle stands when nearly closed, with the opening in its channel nearest to the jet located at the low side of the tube, has a tendency to obviate those irregularities which often arise when insufficient suction leaves a portion of the gasoline drawn from the jet in a liquid or semi-liquid state without any provisions being made for taking such portions of the fuel to a spot where the air current is concentrated and rapid. In that case, an acceleration draws upon this spilled fuel, as well as upon the jet, and the composition of the mixture becomes irregular and especially too rich, resulting either in difficult ignition and skipping or in jerky explosions of greater violence than the amount of acceleration called for. By the design of the Jarnac the weight of the fuel remaining unvaporized at any given moment takes it naturally to the small lower opening at the entrance to the throttle, and by the strong current of air which is always felt there, so long as the large jet is in operation at all, the interior wall of the carburetion channel is constantly kept dry, and the accelerations take place as they are intended.

To make the transition from the use of the small jet to that of the large one easy and smooth, it is customary to have the large jets go into operation before the small one has been shut off. As this entails a certain waste of fuel the arrangement made in the Jarnac is slightly different. When the small jet is still open, the throttle begins to admit air through the main channel but at a degree of suction which is insufficient for drawing gasoline from the large jet; the rich mixture from the small jet is thus diluted before the large jet gets into full activity.—From *La Vie Automobile*, December 13.

—

First Principle of Carbureters Condemned by French Critic

ALL carbureters are regulated by approximation. Their adjustment is wholly correct only for one motor speed in combination with one throttle opening. To make sure of having them operate at all under the conditions at which their basic principle fails, provisions are made for drawing more fuel into the mixtures at such moments than should be necessary. This means a waste of fuel and has resulted in the devising of a new accessory called an economizer which, in its various forms, is always an auxiliary device for providing the additional air which the carbureter itself cannot supply because it is designed primarily for other circumstances for which the forces acting upon air and fuel are the same, but for which nevertheless a richer mixture is wanted. In other words, the factors in the design of carbureters by which the doses of air and of fuel are measured off are not in a rational relation to the needs. The main factor upon which dependence is actually placed is the depression or suction produced in the induction conduit. This depression is made to act upon the air intake or upon the fuel admission, but it is always the depression in some form which rules the action. The correct principle would be to regulate the amount of fuel by the amount of air admitted to the cylinder, so as to always get the same weight of fuel for the same weight of air.

The suction which is the motive power by which the cylinder is charged cannot act at the same time as the regulating factor without the introduction of a number of artifices, and then only approximately; in point of fact not even approximately without having the driver actuate an auxiliary air intake or economizer in certain contingencies. The carbureter designed on the depression principle is therefore not fully automatic.

The shortcomings of the depression as a leading principle for regulation appears from the consideration alone that it is in itself variable and also acts through an orifice which is variable. So long as the depression were to act through a constant orifice, its variations could bring about corresponding variations in the amount of gases delivered; and if the depression were constant, but the orifice variable, the same result could be effected. But with both factors varying independently of each other, all regulation becomes a makeshift. Two examples may be cited to illustrate the difficulties.

(*Continued on page* 147.)

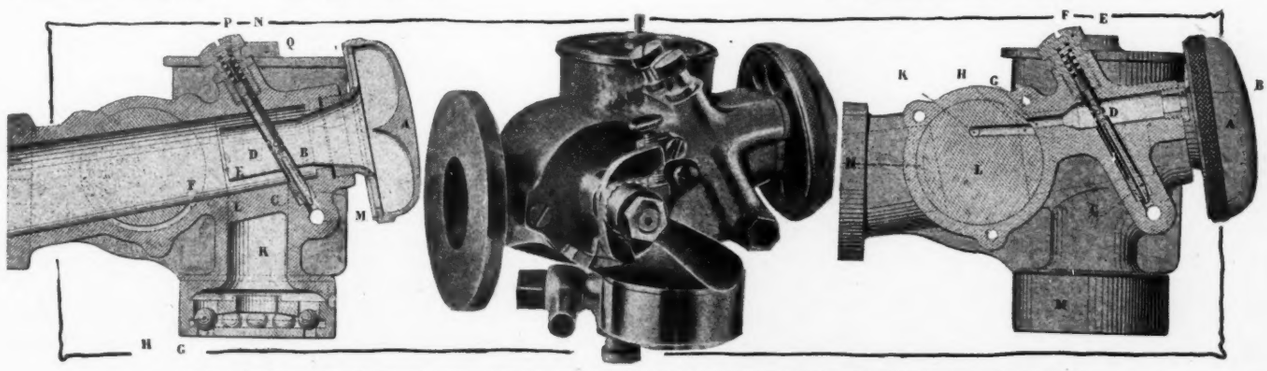
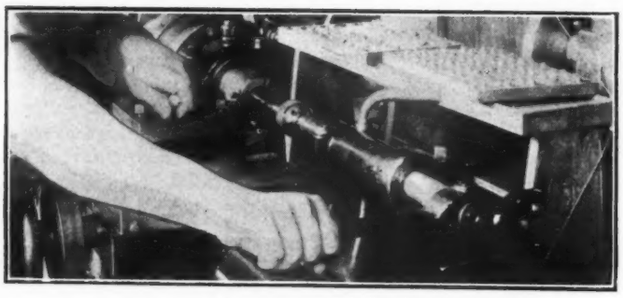


Fig. 2—Views showing arrangement of Jarnac two-jet horizontal carbureter for block-cast motors



The Rostrum

Favors Small Car with High-Speed Motor

EDITOR THE AUTOMOBILE:—No doubt many like myself read with interest the article in the Rostrum in the December 4 issue of THE AUTOMOBILE regarding high-speed motors by Mr. Lockwood, but are not willing to quite agree with him in all his statements. The writer does not particularly favor so-called high-speed motors, but is firmly of the opinion that American automobile builders should plan to produce cars with smaller power units per passenger capacity than are now generally being built and to place much more stress on light weight and economy of operation.

While not so expensive as in foreign countries, the price of gasoline is rising, and big car owners who count the cost are awakening to the fact that their cars are costing them too much to operate. This is particularly true where 90 per cent. of their driving is done on city streets or improved roads where a motor of 3-inch bore and 4¾-inch stroke, giving from 18 to 20 miles per gallon, will do just as well as a motor 4½ by 5½ inches or more, giving 10 to 14 miles.

Again, the item of tire expense is much less on the car with small motor and corresponding smaller and lighter power transmitting units. The greater ease with which the small tires can be changed is also an item not to be forgotten.

In the matters of licensing and taxing, the tendency is now plainly toward levying on cars in proportion to the horsepower of their motors as determined by the S. A. E. formula. Several states have already enacted such laws, and the keen customer bears this in mind when deciding on the car he will buy.

Mr. Lockwood's article states that "our roads as a rule are miserable," and while this has been true, it will not hold good long. The American people are rising to the situation, and "better roads" is the cry throughout the whole country. The writer was privileged to tour across the state of Missouri a week after their "good roads days" early last fall and found that nearly every mile of road traversed had been worked. True, it was not a boulevard all the way, but when every citizen of the state, from the governor down, is sufficiently interested in a common cause to give liberally of his time, work and money toward it, results are bound to follow, and improved roads will be the rule instead of the exception.

On the trip the writer drove a late six-cylinder model of one of our largest builders. It behaved beautifully and was certainly a source of satisfaction and pleasure in the handling, but we met, almost hourly, parties in lighter cars who were apparently touring just as enjoyably over the same roads without difficulty and probably at less expense for gasoline, oil, etc. It is apparent then that large, high-powered cars are not essential to touring even with present road conditions, and improved road conditions will be in favor of the car with a small motor.

Regarding the length of life of the small motored cars, the writer is inclined to believe that other things being equal, they will outlast the cars with excess power, for they are not subject to the same abuse with resulting strains and breakages as are given the larger motored cars because they are so powerful.

There are many more arguments in favor of the small-motored car which space will not permit mentioning, but those briefly suggested are, in the writer's opinion, of sufficient moment to warrant their most careful consideration on the part of the far-sighted automobile manufacturers. There will, of course, always be a limited market for powerful cars, but they will not fill the demand of the masses of the buyers.

Detroit, Mich. J. G. AUSTIN.

Opposed to High-Speed Motors

Editor THE AUTOMOBILE:—I have read a great deal in THE AUTOMOBILE during the past year about the high-speed, small-bore motor which has been developed in the foreign countries. I also note a great many of our American manufacturers are producing a motor of much higher speed than they have produced before. It makes no difference how well a motor may be designed, and the manufacturer can use the best materials possible and can balance his motors to the best of his ability, the fact remains that this high-speed type of motor will wear out a great deal faster than the slow-speed type which is built with the same care.

I have driven cars a great many years and I think the American public wants a motor that will last a few years and not have to buy a new car every other year in order to have a nice quiet and well running motor.

Our conditions in this country are so entirely different from those across the Atlantic. Their gasoline costs three times as much as ours. Our taxes are almost nothing in comparison with

foreign taxes and this has been the most important factor in the present popularity of the small-bore motor in Europe. The ideal motor is one of medium speed, one that has great wearing qualities yet is designed for maximum efficiency. It is possible to make a motor of this type with as low a gasoline consumption as is experienced with the best high-speed designs. In fact the motor speed has very little to do with the gasoline consumption per horsepower, and the real reason that such high economy is obtained by the small cars across the water is not because of the small high-speed, lightweight motors used but because the total weight of the cars themselves is so small that the gasoline consumption must necessarily be low no matter what kind of an engine is fitted.

Nor is it true that a motor of moderate speed should be any heavier than one of high speed because although the latter develops greater power per unit of piston displacement the parts must be made heavier to withstand the increased strains that are caused by the excessive speed.

To sum up, what is wanted is a lightweight car, a touring car built on the cyclecar idea, with a light, simple body and four-inch upholstery. Such a car equipped with a slow-speed motor of moderate power would have a gasoline consumption that would equal that of the best small cars of Europe and besides would give longer and more satisfactory service than any car now in existence.

Cleveland, O. H. H. C.

Ball Bearing Crankshaft Assembly.

Editor THE AUTOMOBILE:—Referring to the Rhineland Machine Works Co.'s article on ball-bearing crankshafts, which appeared in the November 27 issue of THE AUTOMOBILE, it would no doubt enlighten a great many readers if the sizes of the crankshaft were given in a way to show the adapting of the bearings to the shaft. I do not see how it is possible to assemble the bearings as they are shown in your cuts.

Williamsport, Pa. W. H. SACKMAN.

—The Rhineland Machine Works Co. describes the assembly of these bearings as follows:

Bearings at the ends of both shafts shown in Fig. 1 are mounted in the usual manner. The middle bearing of the three bearing crankshaft, it will be noticed, has a very large bore and will readily pass over any of the webs of the crankshaft. It is mounted on a large split adapter which assists in the accomplishing of this result.

Regarding the three middle bearings on the five bearing crankshaft, it is seen that the bore of those nearest the end is sufficiently large to readily pass over the web of the crankshaft from the end to which they are nearest, the shaft for the bearing at the end being considerably smaller than the shaft for the next bearing.

Regarding the middle bearing on this crankshaft it will be noted that the bore of same is larger than that of the other bearing on the crankshaft. This rests against the shoulder on the right hand side, being held by a lock-nut on the left. When this nut is unscrewed and removed the bearing can be readily slipped over the crankshaft towards the left.

The parts of the crankshaft on which the bearings are mounted and the web of the crankshaft have such a relation to the bore of the bearing as to readily permit of the bearings being stripped over all necessary parts of the crankshaft until they are finally brought into position.

It is worthy of note that such of these bearings as are to bear a particularly large stress are composed of two bearings each containing one row of balls, the bearings together being assembled in one self-aligning ring. This permits each row of balls to conform to the varying stresses to which they are exposed. The five bearing crankshaft is an especially good illustration as it shows bearings at the end which may be supplied complete by the ball bearing manufacturers and bearings in the middle of the plain annular type, with a self-aligning housing, which may be obtained from the bearing manufacturers or made by any user of bearings who is equipped to perform accurate grinding.

When First Cartercar Was Built

Editor THE AUTOMOBILE:—I am desirous to have some information in regards to the Cartercar.

My age calls for a car that is easily handled. I am somewhat impressed with the Cartercar on account of easy gear shifting, and since I have very little knowledge of friction drive, I concluded to ask your advice. How long has the car been in existence?

Lancaster, Pa. A SUBSCRIBER.

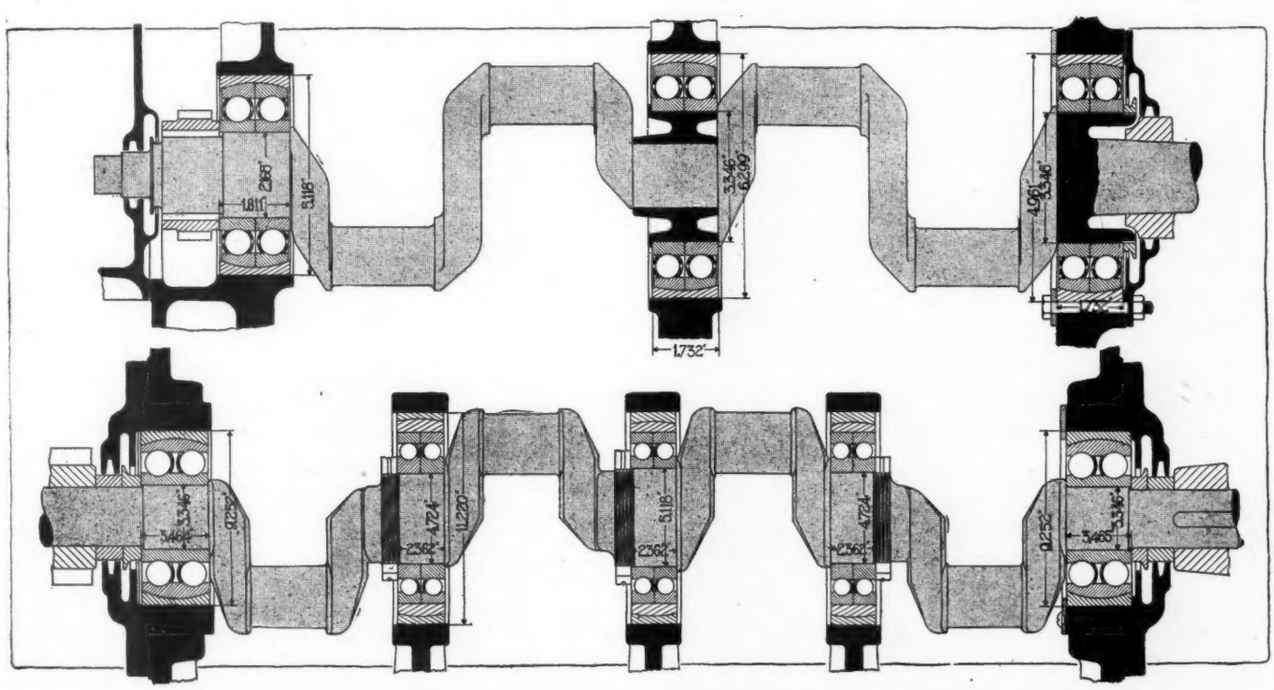


Fig. 1—Upper, three-bearing crankshaft for four-cylinder motor. Lower, five-bearing crankshaft for four-cylinder motor

—It is against the policy of THE AUTOMOBILE to give its opinion as to the ease of speed changing on the Cartercar compared with other machines, but it may be said that the friction drive on this car can be operated by anyone without difficulty.

The first Cartercar was built by Mr. Byron J. Carter, Jackson, Mich., in 1901 and was equipped with a friction transmission.

40-Horsepower Car Is Reader's Ideal

Editor THE AUTOMOBILE:—Having read the description of Mr. Curtis's ideal 1914 automobile, I would like to submit mine. According to my ideas this machine, Fig. 2, should have a 40-horsepower, four-cylinder motor, unit power plant, four-speed gearset and floating rear axle. Overhead valves of large size should be used and the valve mechanism inclosed. I would want a force-feed oiling system with a sight glass on the dash. Motor accessories would include a Bosch magneto and plugs and a Stromberg carbureter. A multiple-disk clutch running in oil and a selective gearset, all a unit with the crankcase, would be employed. Thermo-syphon cooling with a honeycomb radiator should be used.

The front axle should be a drop-forging fitted with extra large roller bearings, and the rear axle a full floating design with well-protected brakes with three-inch face. Five wire wheels, one a spare, would be included in the specifications, the spare tire being carried on the deck at the rear of the car. The tires should be 34 by 5 inches and the wheelbase 130 inches.

The body should be of streamline design with torpedo stern carrying the spare wheel and tools as illustrated. The car should have a V-shaped radiator, honeycomb type, a large steering wheel and a worm and segment steering gear. The fuel tank should hold 20 gallons, an emergency tank placed in the rear holding the same amount. The car should carry as equipment a rainvision windshield, one man top, Klaxon horn, Warner speedometer, an ammeter, voltmeter, oil feed indicator, clock and a primer on dash. The car should have right drive, center control with accelerator and muffler cutout and should sell for $3,000.

Goldsboro, N. C. RAYMOND M. PETTWAY.

1913 Cadillac Electric System

Editor THE AUTOMOBILE:—1—I would like an explanation with diagram showing the Cadillac 1913 starting and lighting system?

2—What formula is used to figure horsepower on the S. A. E. rating?

3—Are square motors preferable for racing cars, and why?

4—Can you tell me the size of bore and stroke of the car which Earl Cooper drove in the Santa Monica and Corona races, and what was the gear ratio?

South Pasadena, Cal. H. B. WILSON.

—1—The starting and lighting outfit used on the 1913 Cadillac is the Delco, made by the Dayton Engineering Laboratories Co., Dayton, O. In this system Fig. 3, the starting motor and lighting generator are combined in one unit. That is one armature and frame is used for the two systems, although the wiring of the two is quite distinct.

The motor circuit is indicated by the heavy black lines and the

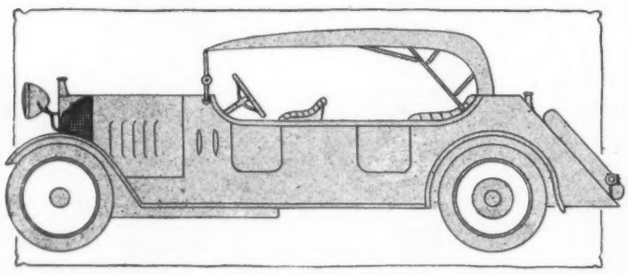


Fig. 2—Ideal car designed by reader. It has a 40 horsepower motor, unit power plant, four-speed gearset and floating rear axle

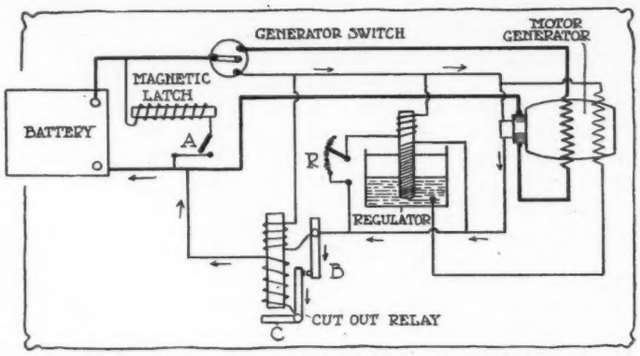


Fig. 3—Diagram of 1913 Cadillac starting and lighting system

generator circuit by the small arrows. The starting system is simple, consisting of a series motor that is connected up to a storage battery by means of the generator switch shown at the top of the figure and which is brought into action by the depression of the clutch pedal after the switch A which operates the magnetic latch has been closed.

The purpose of the magnetic latch is to provide a mechanical connection between the clutch pedal and the generator switch and its principle of operation is as follows: When the motor is to be started the switch A is closed, this magnetizes the coil which surrounds the latch and moves the latch so that when the clutch pedal is pushed out the generator switch closes the motor circuit. The switch A only remains closed as long as the pressure of the thumb is applied to it but the latch maintains connection between the clutch pedal and the generator switch as long as the pedal is depressed, slipping back out of the way when the pedal is let up again.

The lighting system comprises a generator which is driven by the engine and which charges the storage battery. The wires running to the lights are connected to the terminals of the battery but as these connections are simple they are not shown. There are two regulating devices in the generator circuit, one is a voltage regulator which as its name implies keeps the voltage constant and the other is a cutout relay which breaks the circuit when the voltage generated by the motor is lower than the battery voltage.

The voltage regulator circuit consists of a solenoid which is connected across the leads from the generator and which operates a variable resistance that is located in the shunt field circuit of the generator. As shown in the figure the solenoid determines the position of the plunger whose lower end floats in a chamber containing some mercury. The lower end of the plunger has a coil of resistance wire wound on it. Above the mercury tube there is a layer of specially treated oil which serves to protect the mercury from oxidation. Depending upon how deeply the plunger is immersed in the mercury just so will the resistance in the shunt field circuit vary because all the turns of wire on the outside of the plunger that are below the surface of the mercury are short-circuited by it and this automatically cuts that much resistance out of the circuit. Variation in the resistance causes a corresponding variation in the field strength of the generator and of course the strength of the field determines, other things being equal, the voltage generated.

In as much as the voltage varies with the condition of the charge, the intensity of the magnetic pull exerted by the solenoid upon the plunger varies and thus causes it to move in or out of the mercury. When the battery charge is low the plunger sinks deeply into the mercury, and vice versa. Now when the plunger is in the low position, the coil of resistance wire carried upon its lower portion is immersed in the mercury and as the plunger rises the coil is withdrawn. The current to the shunt field of the generator must follow a path leading into the mercury through the resistance wound on the plunger tube and it will be seen that as the plunger is withdrawn from the liquid, more resistance is thrown into the circuit. The greater re-

sistance in the field of the generator causes the amount of current flowing to the battery to be gradually reduced as the battery nears a state of complete charge until finally the plunger is almost completely withdrawn from the mercury, throwing the entire length of the resistance coil into the field circuit, thus causing a condition of electrical balance between the battery and the generator and obviating any possibility of overcharging the battery.

A storage battery requires a higher charging rate in cold weather and to take care of this a variable resistance R is inserted in the circuit of the coil which operates the plunger. This resistance is operated by a small lever located on the dash.

The purpose of the cutout relay is to close the circuit between the generator and the storage battery when the generator voltage is high enough to charge the battery and to open the circuit when the generator voltage becomes less than that of the storage battery. This device is necessary to prevent the storage battery from discharging itself at slow engine speeds.

The cutout relay is an electro-magnet with a compound winding in which the voltage coil is connected across the terminals of the generator and the current coil is in series with the circuit between the storage battery and the generator and is opened and closed by contacts at B.

When the engine is started, the generator voltage builds up until it reaches about 6 volts, at which time the magnetism in the voltage winding is sufficient to attract the magnet armature C and complete the circuit.

When the generator slows down and its voltage drops below that of the storage battery, the battery sends out a reverse current through the series winding which neutralizes the pull exerted by the voltage winding and this allows the contacts at B to be broken.

2—The formula used to figure the S. A. E. rating is:

$$\text{Horsepower} = \frac{D^2N}{2.5}$$

where

D = cylinder diameter in inches.
N = number of cylinders.

This formula is based on the assumption that the mean effective pressure during the power stroke is 90 pounds per square inch and that the piston speed is 1,000 feet per minute.

3—Square motors do not seem to be preferable for racing cars, the average motor size in Europe being 4 by 7 inches bore and stroke and in this country approximately 5 by 6 inches bore and stroke.

4—The Stutz which Cooper drove in the Santa Monica and Corona races had a motor with a bore of 4.75 inches and a stroke of 5.5 inches. The gear ratio was 2.25 to 1.

Grooving Rebabbitted Bearings

Editor THE AUTOMOBILE:—Perhaps you have never noticed that repairmen are often a little lax about babbitting bearings. They are very careful in lining up the parts, in heating the babbitt to its proper temperature, in making the molds, and in everything in fact excepting the making of oil grooves. It is true that many bearings are in daily use without the sign of a groove, but it has been learned through years of experience that grooved bearings are better. Grooves are helpful in distributing oil over the whole surface of the bearing and in maintaining uniform coolness throughout. Besides a groove serves as a sort of reservoir.

When a bearing is removed for the purpose of rebabbitting it should be noted whether or not there are grooves, and if so these grooves should be duplicated after the babbitt has been poured.

It is a simple matter to cut out an oil path with a round nose chisel in a manner similar to that shown in Fig. 4. The groove need not be perfect; all that is needed is a path of some kind to permit the oil to flow easily to the places where it is needed.

After the chiseling is completed, smooth off the rough edges with a round file, being careful not to use the file too vigorously and uselessly scratch the bearing surface.

New York City. W. F. S.

Oil Runs Out of Clutch Case

Editor THE AUTOMOBILE:—1—I would like to have you tell me the actual horsepower of the 1912 model 30 Everitt and the 1912 Maxwell Special, also the 1909 Stoddard 48. I would like to know this because of the new automobile horsepower taxing law in California.

2—In the Maxwell Special is the oil reservoir of the clutch connected to the crankcase? If I fill the clutchcase with more than 2 or 3 inches of oil it runs out.

3—Are square or round tappets considered best practice?

Riverside, Cal. WARREN MOULTON.

—1—The S.A.E. ratings of the Everitt, Maxwell and Stoddard-Dayton are respectively: 25.6, 28.9 and 36.5 horsepower.

2—The clutch case on the Maxwell Special is designed so that oil may run from there to the crankcase and vice-versa.

3—Whether square tappets are better than round or not depends entirely on the conditions under which they are used. It is simpler to make a round tappet and guide but if it is desired to hold the tappet from turning some form of pin construction in which the pin slides in suitable slots cut in the guide must be used. This complication is avoided by using a square tappet.

Motors Used on Various Cars

Editor THE AUTOMOBILE:—1—Is the tendency among automobile manufacturers toward building their own motors, or towards using the product of the large exclusive motor builders?

2—What motor will be used in the 1914 sixes and fours of the following makes: Hudson; Velie; Chalmers; Davis; Glide; Havers; Imperial; Staver; Cole; Speedwell; Pathfinder and Pullman?

Plymouth, Mich. R. J. JOLLIFFE.

—1—The majority of the motor car manufacturers buy their motors. The great argument in favor of this practice is that a concern that makes nothing but motors and manufactures them in large quantities can produce a better and a cheaper motor than the individual car manufacturer, especially if the latter turns out few cars.

2—Continental motors will be used on the Hudson, Glide, Pathfinder, Davis and Havers. The Speedwell will be equipped with either the Continental or the Mead rotary valve at the option of the buyer. A Northway motor will be fitted to the Cole, while a Teetor engine will be found on the Havers. Chalmers and Velie will make the motors for all their models, while the Pullman company will make those used on two of its cars but will equip the small six with a Continental. A variety of motors are found on Imperial cars; models 32 and 33 will have Clark motors, model 33 a Falls power plant and the six will use a Continental.

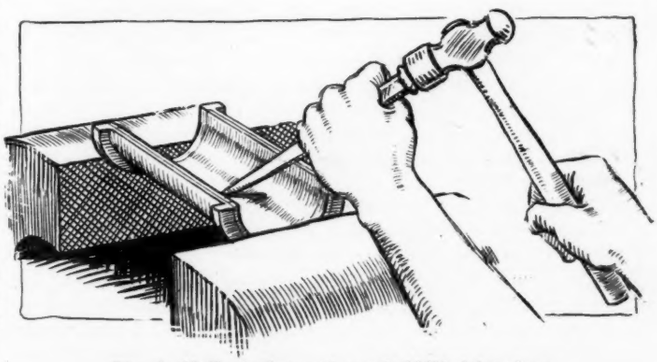


Fig. 4—Method of grooving rebabbitted bearings

Electric Starter as a Saver of Fuel

Reader States That a Test Showed Saving in Fuel by Use of Electric Starter Equal to 33 1-3 Per Cent.—R. H. Coombs Further Outlines His Position on Lighting for Automobiles and Railroad Cars

NEW ROCHELLE, N. Y.—Editor THE AUTOMOBILE:—Pursuing the line of investigation of Sydney Smith, an English engineer, in a recent letter in THE AUTOMOBILE, and following up my own deductions set forth some weeks ago in a letter to the Rostrum, I submit the following data in regard to "the gasoline saved in driving a car equipped with an electric system":

During a shopping trip about New York City, in a high-powered limousine, I took the total miles traveled one afternoon as 11.5. The total time the car was stationary was (for seven stops) 12, 11, 9, 6, 5, 4. 4 minutes, or a total of 51 minutes waiting. This car had no starter, and as the day was cold and the chauffeur could not tell how long he would be compelled to wait in any instance, he invariably kept the motor running most of the time. To be more exact, the waiting amounted to about 40 minutes in all.

Now, on a medium idling speed the 5 by 6-inch motor of this car consumes 5-8 of a gallon in 1 hour with no load, or for the time it was running idle on this particular day it used just about 1-2 gallon of gasoline.

In other words, if this car had been equipped with an electric starter, we would have saved nearly all of that 1-2 gallon of gasoline used in idling, without increasing the exertion of the driver. R. H. Coombs will admit this reasoning, I think.

Now again, the car under discussion only gets about 8 to 9 miles per gallon, but even so, that would mean that our 11.5 miles traveled that afternoon would have been increased to about 15.5 or approximately 33 1-3 per cent. I do not think the generator, if we had one, would have consumed more than a small fraction of that saving.

Just one word about the reliability of an electric starter. I have used one on a car to start the motor over 2,000 times since last spring and no trouble of any nature has developed yet. If I saved 1-2 gallon of gasoline for every nine times I started that motor (adding two starts to the above seven for good measure), I should be in 110 gallons of gasoline or $22 this summer. Would legitimate repairs or maintenance ever come to that in one summer on an electric outfit? I think not.—GEORGE C. CANNON.

Vital Differences Between Principles of Lighting Automobiles and Railroad Cars

INDIANAPOLIS, IND.—Editor THE AUTOMOBILE:—It appears from the article by R. M. Newbold, in THE AUTOMOBILE December 11, that he did not quite get my point when I said that while both the railroad car and the automobile use a dynamo and battery, the similarity stops right there.

The other and minor points of similarity which he points out might be taken for granted, such as the use of lamps, wiring, dynamo regulation, etc.

The similarity can be found only in general descriptions of the apparatus used. The principles of operation show vital differences. The railroad car battery used with an axle-dynamo set weighs 2,600 pounds. The discharge rate is from 30 to 60 amperes, probably 45 amperes average. In other words, the railroad car uses 2,600 pounds of battery in order to insure durability and dependability at a discharge rate which is actually less than the electric automobile starter imposes upon a battery weighing from 80 to 120 pounds.

The ampere discharge rate for lights alone on automobiles will run from 7 to 11 amperes, say, 9 average. To insure the same dependability which the railroads expect, the automobile battery, for lighting alone, would have to weigh considerably more than the batteries now used for lighting and starting combined. This shows that automobile electric lighting and starting practice defies every known electrical law regarding discharge rates, as well as charging rates, in proportion to the weight and size of battery used.

Voltage Employed also Differs

Another vital difference is the difference of voltage employed. Automobile lights work at 6 volts; railroad car lights at 30 to 60 volts. Thus the railroad battery delivers its wattage with far less chemical activity in its battery than in the case of the automobile battery. This difference in voltage has much to do with explaining a point which Mr. Newbold raises himself, and which he admits gives me a "good opportunity to throw the harpoon," namely, the matter of regulating the dynamo. Mr. Newbold seems to think that this matter has been overlooked by most of the manufacturers of electric systems. The truth is that accurate regulation at 6 volts is not only very difficult but practically impossible.

Regulation, in the automobile, has been attempted in two ways: slipping clutches and vibrating regulating devices. At the November meeting of the American Institute of Electrical Engineers in New York, electrical competitors charged that the slipping clutch not only wasted over 1 horsepower, but also gave unending trouble through wear. To this the slipping clutch advocates retorted that, however black it might be painted, the slipping clutch is used by 30 to 40 of the leading motor car makers, because it is more durable than any vibrating regulator, gives less trouble and better regulation.

Mr. Newbold says that it is now possible to purchase a system so regulated as to contain none of these vital defects. But, at the meeting above referred to, one of the leading manufacturers of automobile electrical systems set forth nine great functions of the control which still must be devised. He frankly admitted that while some of the necessary features are found in all systems, there is not "any one system that contains them all." The gentleman who made the statement claims to have put on the first train lighting system in the United States, and therefore, with 25 years' experience, presumably knows the difference between regulation on trains and automobiles.

Railroad Can Use Heavy Regulators

The railroad car system employs regulating devices which weigh about 200 pounds. These devices are large and substantial, being constructed without limiting their efficiency by limiting their size, and in addition to this their comparative accuracy of performance is insured by the high voltage employed.

Mr. Newbold says that the railroad system does not receive proportionately more attention than the automatic system. I have had some experience in the matter, and doubtless Mr. Newbold has, but the experience of the railroads themselves is more to the point. In order to eliminate any doubt on this matter,

since reading Mr. Newbold's article, I have spent the better part of a day in a rather complete electrical plant maintained by one of the largest railroad systems in the country, and I find that even on through trains passing through this city the electrical equipment is inspected here and at other principal points. The battery is given a voltage reading and the dynamo is given an exterior examination—this latter examination being due in part to the fact that accidents have been caused by the dynamo jarring loose and falling off the car. If the examination at any of the larger cities, or at the division terminal, shows that any battery has run down below a certain point, that battery is singled out for immediate attention at the division terminal. On some roads, and by some terminal associations, the batteries are charged at every terminal, whether they be on cars using axle dynamos or straight storage.

Facts on Railroad Car Lighting

Another item in railroad car lighting practice which should be of interest, is the fact that a certain large railway system in this country employs dynamos only on its mail cars and sleepers. Practically all of its other cars are lighted by a straight storage battery system without dynamo. The decision on this equipment was based originally on the reports of the locomotive engineers, who stated that the throttle had to be opened wider and that "it felt like somebody had the brakes set" when the train, including cars with dynamo equipment, got up to generating speed. Investigation showed that generating electricity in this way, with the excess coal required on a locomotive and with the excess care required in looking after the equipment, was too expensive, and that the minimum expense could be had by using batteries twice as large (weighing 5,200 pounds) and charging these batteries with current from a power house. These batteries, like the batteries used with axle-dynamo sets, are carefully watched and recharged every time they reach a terminal.

Public Should Not Be Misled

I disclaim any desire to throw harpoons, as Mr. Newbold charges, nor have I intentionally made any mis-statements, such as Mr. Newbold makes when he says that in using storage acetylene it is necessary to get out every 20 miles and adjust the cylinder valve. I am assuming that any discussion on this subject should have but one object, and that is to present the truth to people who are interested in the truth. If it is true, as Mr. Newbold says, that carrying electric equipment means practically carrying one extra passenger at all times, well and good; but has the average buyer of a medium-priced car been permitted to know it? Doesn't the extra passenger have to be paid some wages in spite of what Mr. Newbold says? If the buyer is entitled to know these things, then the harpoon which Mr. Newbold refers to is being wielded, not by the few who are trying to open his eyes, but by the people who are asking him to do his buying with his eyes shut.—R. H. Coombs, Prest-O-Lite Co.

Self-Starter Tests Should Be Made with Standard Sized Automobile Batteries

Plainfield, N. J.—Editor The Automobile:—In the article describing and illustrating the Gray & Davis engine starting motors, which appeared in The Automobile for December 11, you published some characteristic curves of the electric motors which showed the efficiency maintained at or near the maximum value over a very much wider range than can be possible when taking current from even the largest starting battery that is ever carried upon the automobile. These curves are misleading.

The efficiency of an electric motor may be quickly determined by the formula,

$$E = \frac{T \times S \times .142}{V \times A}$$

in which

E = the per cent. of efficiency.
T = torque developed at one foot radius of the armature shaft.
V = volts applied at the motor terminals.
A = amperes passing through the motor.

Transposing we have:

$$\text{Volts} = \frac{T \times S \times .142}{E \times A}$$

Accordingly it is found that the performance curves referred to were made with the voltage held constant at 6 volts over the entire range given, from 80 to 310 amperes, a condition that could be maintained only with a large 6-volt dynamo, which was evidently used in the tests, or with a battery of infinite size.

Performance Depends on Region of Efficiency

To be at all intelligible and of any use whatever to the engineer or to one wishing to select a motor for engine starting the performance curves should always be plotted against the actual voltage of the storage battery that will be employed on the automobile. Furthermore, little is told by curves of this sort which show the performance only in the region of their maximum working efficiency. The only fair and square way is to give the whole performance all the way from free running with no load to the absolute stalling point. The rapid droop of the speed and efficiency curves is due, more than anything else, to the rapid drop in the voltage of the diminutive battery under the excessive loads. Where the battery voltage and stalling current are given, one can instantly determine by Ohm's law the true ohmic resistance of the machine, which gives a good idea of the excellence of its design.

Battery Voltage Drops Rapidly

According to the most sanguine statements of the battery manufacturers the voltage of the 100 ampere-hour battery commonly employed, after discharging for but 5 seconds at 310 amperes will be but 4 3-4 volts instead of the full 6 volts assumed in the curves in question and therefore the speed and efficiency will be very much lower than there given.

The curves referred to presumably purport to show the performance of the electric motors employed with the differential or "Wobble Motion" speed reducing gear illustrated in the same article. As such, a reducing gear cannot by any possibility show a high transmission efficiency even when new and well oiled. The final efficiency from battery to crankshaft cannot be much better than 45 or 50 per cent. even with the engine in normal free running condition.

Instead of publishing curves showing the efficiency at the end of the shaft of the simple series wound electric motor employed, it would be much more instructive to show what the engineer and the car owner desires to know, the efficiency from battery terminals to crankshaft.—S. W. Rushmore, Rushmore Dynamo Works.

—

New York City, Jan. 2—The Central Railroad of New Jersey has notified the Board of Public Utility Commissioners of that State that it will hereafter use a large red disk bearing the word "Stop" in white letters, to be shown by the crossing watchman, instead of the customary white flag. Red lights of a special design will be used at night.

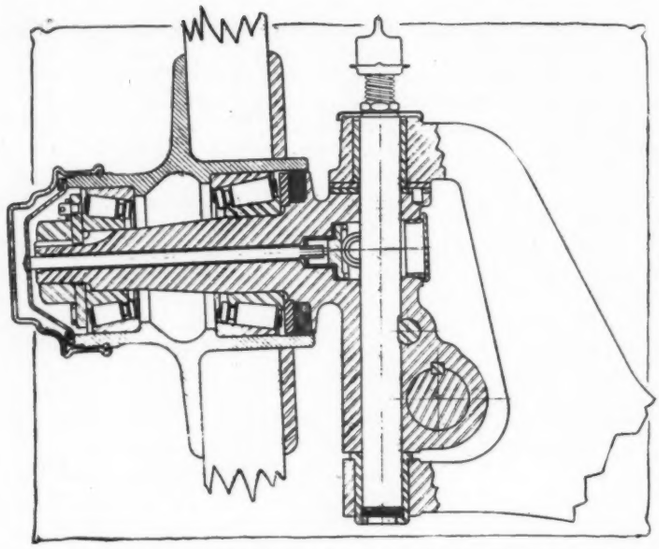


Fig. 1—Empico speedometer drive of bevel gear type as used by Timken-Detroit Axle Co., Detroit, Mich.

Motor Patents Co. Exploits Perrin Patents

Empico Speedometer Drive and Perrin Tire Carrier Are Two Promising New Accessory Features

Harry A. Lozier Is the Moving Spirit of Co.—Perrin Also Connected

IN September, 1912, several men prominent in Detroit automobile affairs quietly organized a concern which had a different idea as compared with the general run of businesses in the motor car industry. It did not propose to market cars, nor to make them; nor did it intend to manufacture a new accessory or a new part.

The concern is the Motor Patents Co., which has Harry A. Lozier as its moving spirit. J. G. Perrin, engineer for the Lozier Co., is also connected with the enterprise in a similar capacity. But the Lozier Motor Co. has no interest whatever in the Motor Patents Co., and while H. A. Lozier retains a large interest in the Lozier company and is still a member of its board of directors, he is devoting his entire time and attention to the business of the Motor Patents Co.

To Acquire Control of Patents

Briefly, the policy of the concern, as now made public, is the exploitation of articles of merit which are improvements on any part or parts of the modern automobile. It is made clear that nothing will be taken up which is not an improvement, and that no time will be given to the placing on the market of anything which adds any considerable amount to the cost of construction. Mr. Lozier states that the Motor Patents Co. will acquire exclusive control of anything which it handles, either through the purchase of the patents involved or by contract on a profit-sharing basis.

The Motor Patents Co. is at present devoting much of its time to the exploitation of the Empico speedometer drive, so called. This is the invention of Mr. Perrin, and it is really responsible for the formation of the patent holding company. Other patents and patents pending, which had more or less bearing upon the principle developed by him were purchased by the Motor Patents Co., so that now the drive is well protected by the concern.

Though remarkable progress has been made during the past few years in the development and refinement of other units entering into motor car construction, little has ever been done toward the improvement of the speedometer driving mechanism until recently. Mr. Perrin saw great disadvantages in the usual method employed, whereby an exposed gear attached to one of the front wheels gears to a pinion attached to the flexible shaft which runs the speed indicator. He therefore developed the inclosed drive which has now been adopted by several of the makers of cars.

Empico Made in Two Forms

As now used, the Empico drive takes two forms. Fig. 1 illustrates the construction used in the Timken-Detroit axles and in the Cadillac, as well as in the new Lozier four-cylinder machine.

The Empico drive is simply an inclosed means of transmitting the rotative motion of one of the front wheels to the speedometer flexible shaft. This is done by running a small shaft through the center of one of the front wheel spindles, which shaft connects with the hub of the wheel inside of the hub cap. At its inner end, this small shaft connects with another through either bevel or worm gearing. The latter shaft has provision at its outer end for the coupling on of the flexible speedometer shaft.

Fig. 1 shows the drive's application through the use of small bevel gears, while the Hudson and Chalmers type is a worm gear installation. In each case the gears are housed in and effectively protected against mud, dust and other foreign matter with which the wheel comes in contact. The inclosed feature makes positive lubrication possible at all times.

Inclosed Gears Cannot Get Out of Mesh

Naturally, this drive construction makes a very much simpler appearance at the front, doing away as it does with exposed gear wheels, swivel joints, bolts and clamps. Some of the advantages other than this, which the Motor Patents Co. sets down for the drive, are that the inclosed gears cannot get out of mesh, with the result that there is always an accurate mileage record for the trip and season; that the protected gears, constantly lubricated, will not wear out in the lifetime of the car, and that the drive is noiseless.

Still another novel device which is being fathered by the Motor Patents Co. is the Perrin tire carrier, invented by Mr. Perrin and

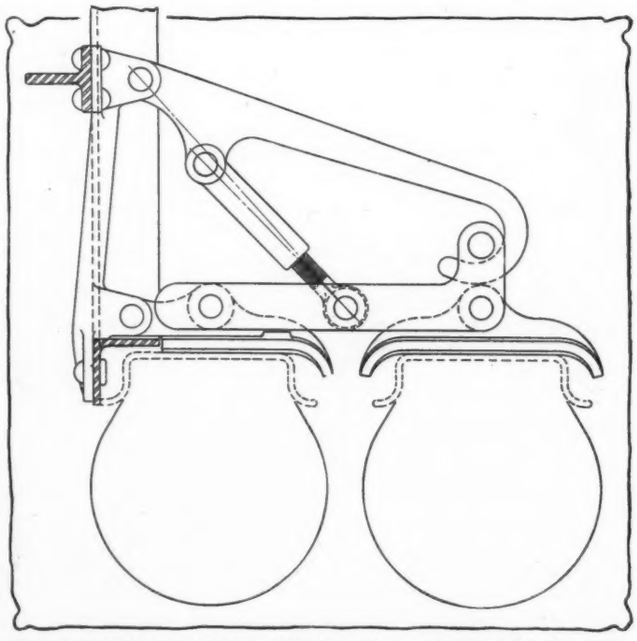


Fig. 2—Special toggle lever with two clamps for carrying two tires

purchased by the former. This carrier, which is intended for attachment at the rear of the chassis, makes the removal of the spare or its replacement rigidly in position for carrying a matter of seconds. In fact, due to its simplicity, it is claimed that the tire can be removed, placed on the ground, replaced and clamped on again in less than 5 seconds actual time. It should offer great possibilities for racing.

Tire Carrier for Quick Action

The Perrin carrier consists of an angle-iron ring supported in three places by drop-forgings. One arm attaches to each side member of the frame, while the third is a bracket which fastens to some convenient point on the rear cross member of the frame or cross spring hanger, if the car has a platform rear suspension. There are two upper brackets on which the tire rests as it lays against the iron ring which is inclined at a slight angle. The lower clamp has a toggle lever and when it is forced down it draws the rim firmly down on these upper brackets. In this closed position, it is impossible for the spare tire to move at all. There is also provision for locking the toggle lever in position as insurance against theft of the tire.

The illustrations give the construction and operation of the device clearly. In removing the tire and rim the operator first lifts the toggle lever handle which raises the clamp from the rim. The lower part of the tire is then moved a few inches from under the clamp and the tire is simply lifted from the two upper supports. Fig. 2 depicts the carrier in readiness to again receive tire and rim.

A modification of this form of the Perrin carrier is also offered which makes possible the carrying of two tires. The only change is in the lower clamping device, a special toggle lever with two clamps in connection with it replacing the single clamp type. A drawing of this double clamping construction is shown in Fig. 3. The regular upper brackets will support two tires, the hinged part folding up against the tire when only one is carried.

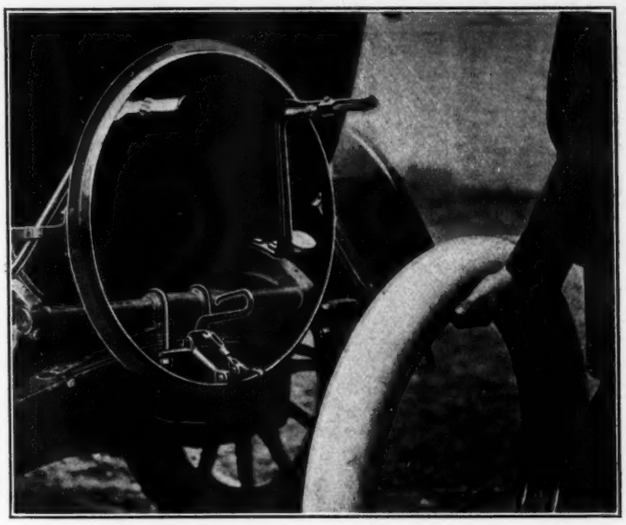


Fig. 3—Tire and rim removed from the carrier. The parts are in position to receive the tire again

Special emphasis is laid upon the small number of parts to this device by the company, which also points out that no straps, wedges, or bolt apparatus is needed with it.

First Principle of Carbureters Condemned by French Critic

(*Continued from page* 139)

(1) The motor is running light. The depression is considerable above the throttle and nil below it. The carburetion is good, as the carbureter has been designed with this condition in view. But now the throttle is opened suddenly. The motor cannot acquire speed until it has received the fuel necessary for overcoming its inertia and producing the speed. At the moment of the intended acceleration the throttle is consequently wide open but the depression is very weak. The carbureter, on the other hand, has been designed for having a considerable depression when the throttle is open, because the wide-open condition of the throttle is meant to correspond to hard work by the motor and high fuel consumption. The depression principle thus produces a lack of fuel for sudden accelerations.

(2) The motor turns fast, running idle with the throttle almost closed. The depression above the throttle is very considerable; that below is weak. Suppose we let in the clutch without touching the throttle. The motor speed is reduced. The depression is diminished correspondingly both above and below the throttle. At the same opening of the throttle the motor thus receives less fuel now, when put to work, than it received running idle. It therefore turns slower and slower. And now, if we open the throttle, to remedy this condition, it is the first case which is reproduced, and, instead of helping the motor to pick up, we reduce the depression still further and the motor receives no fuel at all.

In practice, these situations are obviated only by creating a resistance to the entrance of air in the carbureter, thereby producing a special suction, below the throttle, by means of which the fuel is, after all, delivered, and it must be admitted that this artifice is pretty effective. Still it is accompanied by some inconveniences. The resistance created at the air intake acts as an obstruction when full power is wanted and makes the motor draw proportionately more strongly upon the fuel than upon the air, and it is at this juncture that the economizers become necessary in order to correct the mal-adjustment and save the costly fuel at the same time. But, as said, the economizer cannot be an automatic feature.

All told, it appears that all the progress has been made which is consistent with the principle of the depression as the regulating as well as the motive factor in carburetion and that it is time to launch upon a new path. In order to make the carbureter as perfect as is, for example, the magneto, it is necessary to base it upon a principle which is intrinsically correct, in other words to attempt to utilize the air charge for the motor for the regulation of the fuel charge.—From *Omnia*, December 20.

The Melting of Tungsten—Very small additions of carbon reduce the fusion point of tungsten in very high degree. The reason for this fact has been discovered by Otto Ruff who explained before a convention of naturalists and physicians in Vienna, in September, that it is due to the formation of a tritungsten carbide, whose existence had not been demonstrated before, though it was known that a mono-tungsten carbide and a big-tungsten carbide were formed. A 1 per cent. alloy of carbon is represented in the metal by 4.7 per cent. of the tritungsten carbide.—From *Technique Moderne*, December 1.

Unsprung Weight and Rebound—Some discussion is now coming up, occasioned by the appearance of new shock absorbers, as to whether the checking of the extension of vehicle springs does not have a tendency to lift the wheels from the ground, especially when the weight of wheels and axle, together with other material only in part suspended on the springs, is kept as low as possible with a view to the tire economy said to be effected by this means. It is argued that the upward momentum of the body and load, if prevented from taking action on the springs, necessarily must act on the axle and will make the wheels bob, the result being the wear of tires.

The Automobile

PUBLISHED WEEKLY

Vol. XXX Thursday January 8, 1914 No. 2

THE CLASS JOURNAL COMPANY
H. M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
231-241 West 39th Street, New York City

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To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order, or Register your letter.

Entered at New York, N. Y., as second-class matter.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

The Electric Transmission

THE present exhibition at the Grand Central Palace can truly be looked upon as a convincing chapter in the victory of electricity in the gasoline car. There is electric lighting seen in 99 per cent. of the exhibits, with the exception of the small cars of cyclecars; there is electric starting seen on every hand and asked for everywhere; there are electric vulcanizers for tire repairs; the electric brake was described in these columns a week ago and is seen for the first time at a show; and there is, last, but not least, the electric transmission, which in its present form, gives promise of being one of the biggest revolutionizers in the automobile industry. The Entz electric system in the form exhibited has been tried out for years, and in its present refined state has shown that it can take the place of the clutch, the transmission gearset and perform the functions of the electric starter and the electric generator for battery charging as well.

The electric transmission gives promise of sooner or later becoming as integral a part of a car mechanism as the present gearset has been during the past 10 years. With the electric gearset, the time-honored objection of having to carry a large battery has been eliminated, and with the present perfected electric unit a battery is not needed at all, a car being able to go across the continent without a battery. At present a small starter battery is carried, the same as carried in any gasoline car provided with an electric starter and electric lights.

To the land-wide question "Why should the electric transmission supplant the present gear type?" comes the answer of simpler control, greater quietness and added flexibility. The simplified control will be sure to develop a large following for the same reason that self-starters and electric lighting have. Where traveling on low, second or intermediate speeds is as quiet as on high, is an advantage that everyone is ready to avail himself or herself of. There are owners today who are frank in admitting that they would drive their own cars more if it were not for the gearshifting. The electric transmission will eliminate such objections.

The simplification brought about by the electric transmission system is one of its considerable merits, in that it removes two separate units from the motor, the starter and the generator, and combines both of these functions in the electric units that take the place of the flywheel clutch and the gearset. It goes a step further than the electric gearshifters of today, although its operation is not any easier to control than they are. This electric transmission system brings the control of the gasoline car practically on a par with that of electrics, and with the coupé body, makes an ideal car for women's use, the only uncertainty being the pneumatic tire, which, however, has been largely rid of its horrors by the demountable wheel and the demountable rim.

Building America's Reputation

THE 336-hour test of the Moline-Knight motor will do more than anything else to stamp out the general rumors that the sleeve-valve motor can be built satisfactorily in Europe, but that few American builders are competent to produce it, these rumors having been generally circulated by those entirely unfamiliar with the motor, with its methods of manufacture or with the relative merits of American factories as compared with European factories. These rumors, which have been more or less current since the introduction of the Knight motor in America, are in keeping with other malicious rumors that have been so rife during the last 6 months, and which are invariably circulated, not through a spirit of benefiting the industry, but rather through one of maligning a competitor. These rumors have all been acknowledgments that the foreigner can build better than the American, but fortunately the recent test has shown that a motor of this type built by an American concern can undergo a better test than any foreign one has taken to date. In a word, the test is an international vindication of American prowess, in spite of the fact that many of our own makers would like to belittle a fellow maker and lend a "boost" to a foreign corporation. This would be justifiable if it represented the truth, but when facts prove it otherwise it is time to cease slandering.

The test just completed will add renewed confidence and give stimulation to the industry in general, to makers of poppet-valve as well as makers of sleeve-valve motors. When the second motor that a manufacturer builds can go through a gruelling test of this nature and emerge at the finish showing higher horsepower than at the start or at any time during the test, it is enough to convince the most skeptical of the progress that American manufacturers are making. The Moline company is to be

congratulated on the enterprise it showed in staging this test, and further on the confidence it showed in its own product. More genuine demonstrations of this nature in periods of stringency will do the industry much more good than wrapping your feet in wet blankets and packing them around with ice. Keep the public attention on the industry, keep the industry before the public and keep it before the public in a manner that is above criticism. This is worth a thousand times more than idle braggadocio publicity that tells nothing.

Reaping the Profits

CARRYING lamps with no oil in them is as wise a policy as that of renting space at an automobile show, shipping cars or accessories to occupy the space and then not manning the exhibit with adequate help to thoroughly explain it and to give whatever other information may be needed. The exhibitor is only getting a 50-per-cent. show when he neglects this major part of the task. Visitors attend a show to get information, information on new cars and information on new and old accessories. These visitors are the buyers of today and tomorrow, and the more they know about an accessory or car the more certain are they to think of that accessory or car when making a purchase. Each exhibit should be manned with attendants who know the parts exhibited. If it is a carbureter exhibitor, the attendants should be adepts at carbureter remedies, familiar with every detail of adjustment.

Exhibitors will never get 100 per cent. efficiency out of their exhibits until they prepare more adequately for the show and train their men more skilfully in the art of explaining the functioning of their accessory or car part. The ignorance of exhibit attendants is proverbial. The best show investment is that of schooling the entire force of attendants, not only in your own product, but also in the relative merits of your product with that of other rival exhibitors. The up-to-date house gets its exhibit attendants together previous to the opening of the show and sends them to the exhibit under instruction, instructions on the proper kind of information to give, instructions on how to speak of the goods of the rival and instructions on many other points. One energetic maker makes it a policy to have its attendants visit the booths of all rival makers at a show and get all information on their products. This done, there is a short school, so to speak, at which the attendants talk over the relative merits of different exhibits and arrive at honest methods of discussing different makes, and also receive final instructions as to how visitors should be answered. Such a policy is commendable, in that it insures intelligent answers, and assures the maker of the exhibit that the attendants are following a consistent policy in their explanations.

The Four-Floor Show

AN attendance of over 20,000 on the opening night of the present Grand Central Palace Automobile Exhibition was almost overcoming to many exhibitors who vainly imagined that a successful show could not be held in any other building than Madison Square Garden. The figures on opening night were ahead of those of opening night in the Garden a year ago, and the manner in which the crowds were distributed over the four floors on which the exhibits are placed has demonstrated that the multi-floor show is not only a possibility but an actual success. One factor which has largely aided in distributing the crowds is that of carrying visitors in the elevators to the top floor, where the accessories are, and requiring that they walk down to the three remaining floors, filled with accessories and cars.

There is a sombre air about the show that a little more color would dissipate, due to too many black and dark-colored cars. The visitor meets space after space filled entirely with black or dark-colored cars, and welcomes other spaces where a bright yellow, a brilliant red, a maroon, or a green, relieves the monotony. There is a happy mean in color which is most desirable and, while nobody is deeply interested in the fanciful creation that has no utilitarian value, it is true that in everyone is a chord that responds to a little brilliancy. The recent shows at Paris and London displayed much more color in bodies and trimmings than is seen at the present show. The lack of polished chassis is noted from end to end of the show, and those stands with good chassis exhibits are easily recognized by the crowds that invade them.

Manitoba Has Over 4000 Cars

WINNIPEG, MAN., Dec. 30—Statistics issued today by the Municipal Commissioner's department for the province of Manitoba show in the case of passenger cars an increase of over 38 per cent. or 1,150, as compared with the 3,000 cars in use in September, 1912.

Commercial vehicles also show a distinct gain, a little over 100 new machines having been put into service during the twelve months ending today.

The increase is not confined to any one particular section but is spread generally over the entire province and a noticeable increase has been shown in the number of cars sold to farmers.

Three hundred and thirty-seven persons were convicted during the year for speeding, twenty-one were convicted of driving an automobile while under the influence of liquor, 143 for having no lights, seventy-one for having no chauffeur's license, and forty-nine for failing to have a number plate.

New York Registration 135,000

ALBANY, N. Y., Jan. 3—According to the figures given out by Secretary of State May, of New York, the Empire state has now 135,000 registered automobiles and motor trucks. In the issue of THE AUTOMOBILE for December 11 the registration figures for that state were given as 121,793 up to the end of September, 1913. The new figures are given out by the state registration officials as being up to the end of the year 1913. Secretary May showed a great deal of enterprise in making an independent census of the registration in the various states but there are some very important omissions, California among them, which render the total incomplete.

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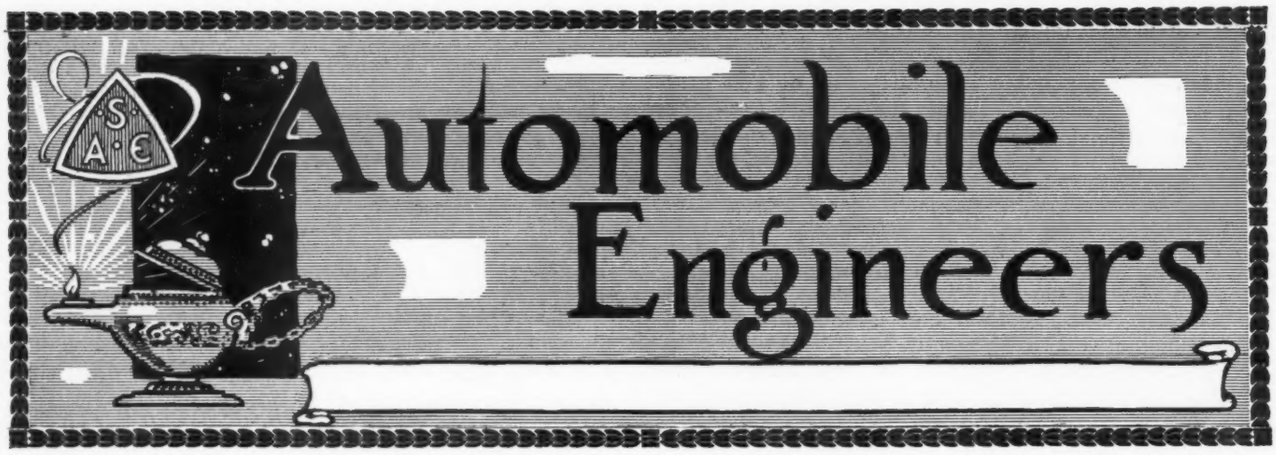
OTTAWA, ONT., Jan. 2—The growth of the automobile in Canada is shown by the fact that gasoline valued at $5,846,364 was imported during the last fiscal year as compared with $1,961,015 for the year before.



Leland President of S. A. E.

Winter Session in Full Swing—Standards Committee Divisions Submit Report on Broaches, Ball and Roller Bearings, Electrical Equipment, Etc.—Important Papers Read

NEW YORK CITY, Jan. 6—The Society of Automobile Engineers opened its annual winter meeting today at the Automobile Club of America with President Howard Marmon in the chair. The election of officers for next year and the reports of officers occupied the members during the morning. H. M. Leland, president of the Cadillac company, was elected president; W. G. Wall, of the National company, succeeded J. G. Perrin; K. W. Zimmerschied, of the General Motors Co., the other vice-president, suceeding Russel Huff. The other officers elected were two councillors, Henry C. Wilson and Christian Girl. Hermann F. Cuntz and Coker F. Clarkson remain as treasurer and secretary, respectively.

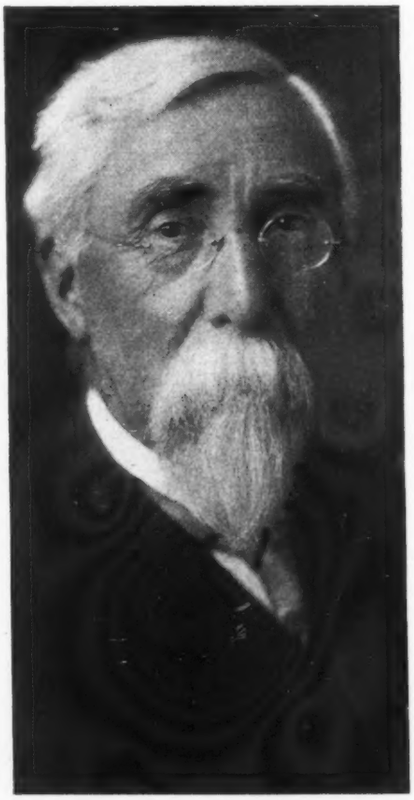
Preliminary meetings of the standards committee were held yesterday when reports of the different divisions were received for presentation to the society as a whole today and Thursday. The social portion of the program began with a reception at the Manhattan Automobile Club Sunday afternoon. Today's professional session is to be continued Thursday, the meeting ending Thursday evening with the annual banquet at the Hotel Plaza.

That the society is in good financial condition is indicated by the treasurer's report presented today, showing a balance of over $5,000, as compared with a few hundred dollars at this time last year. In another respect the society is growing, the membership report showing 182 new members for the year.

The standards committee, upon which falls most of the work of the society, has done much toward the standardization of sizes and materials of automobile parts and accessories, as indicated by the reports of the various divisions yesterday and today.

President Marmon opened the winter session this morning with an address on the progress of the work of the society. The keynote of his address was the necessity of more frequent committee meetings. He spoke of the necessity for having more money to meet the increased expense due to holding more of these meetings and stated that he hoped that by the end of another year the society would have outside sources of income which would enable the expenses of these meetings to be defrayed.

President Marmon described the last summer session as a success, stating that, "The presence of the members of the I. A. E. enhanced the value of the trip." The only criticism that he had to offer was that the membership hall was too small to adequately meet the needs of the society. For the coming summer it has been planned to hold the session at Cape May, where greater facilities will be offered.

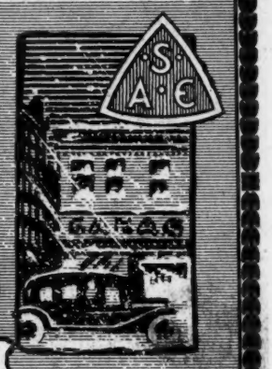


HENRY M. LELAND

Henry M. Leland, president-elect of the Society of Automobile Engineers, is president, advisory manager and a director of the Cadillac Motor Car Co. Mr. Leland, who is today looked upon as one of the bulwarks of the automobile industry, has been connected with it since 1900. In 1890 he organized the Leland & Faulconet Mfg. Co., Detroit, and 12 years later the Cadillac Automobile Co. This was consolidated with the present Cadillac Company in 1905. Mr. Leland was born in Danville, Vt., Feb. 16, 1843.

Mr. Leland was elected a member of the Society on Feb. 16, 1909, and his name at the head of its representative list of officials for the coming year will lend even greater prestige to the organization. He is widely known in automobile engineering circles here and abroad, and stands high as a pioneer in the development of the motor vehicle of today.

In Mid-Winter Conferences



Messrs. Kennedy, Moscovics and Anglada were appointed to count the ballots for the election of officers.

Hermann F. Cuntz read the treasurer's report, which showed the society to be in a prosperous condition. At the close of the fiscal year October 1, 1913, the cash on hand amounted to $5,273.35, as compared to a few hundred dollars the year before. Mr. Cuntz stated that conservatism in expenses has been the keynote of the policy of the society, and for that reason the growth in the expenses has not been commensurate with the growth of the work.

Coker Clarkson, general manager, read a report on the growth of the membership of the society. He stated that since the summer meeting there have been 184 new members elected who are divided into the following classes: Members, seventy-six; Associates, ninety-three, and Juniors 15.

Arthur B. Cumner read the report for the committee on constitutional revision.

It was decided to mail this to the voting members for their consideration at least 60 days before the next meeting of the society. R. M. Lloyd asked the reason for suggesting the departmental membership class suggested in the report of the committee.

Mr. Cumner explained the value of securing government cooperation in the work of the society by explaining that the governments are using automobiles in constantly increasing numbers, and any help which could be given them should come from the society rather than from outside sources. The reason that the 10-year clause is inserted is because there would be considerable difficulty in securing annually such small appropriations with any certainty.

Data on European Trip

Mr. Cumner also read a report of his investigations in securing data on the cost of making a trip to Europe to return the visit of the I. A. E. and to make several other points of interest. The suggested trip requires thirty-nine days, sailing from New York for Paris on October 10, and then including the itinerary: Turin, Stuttgart, Berlin, Frankfort, Cologne, Essen, Brussels, Antwerp and a number of other points, reaching London in time for the Olympic show. The entire trip could be made at the inclusive figure of $550 per person.

President Marmon stated that he believed the required 75 members would be easy to secure, and it was decided that the members should be circularized with an idea of finding within reasonable limits the number of persons who could be counted on to make the trip. It was also suggested that the trip could be shortened by anyone who desired to economize on time by either eliminating the Berlin trip or cutting down the time in Paris and London.

At the close of the discussion the report of the Ball and Roller Bearings Division was submitted by its chairman, B. D. Gray, of the Hess-Bright Mfg. Co. In submitting the report it was stated that since the meeting of the committee last June it was found that the tolerances first adopted last June were too close to be practical. The tolerance of .0002 inch was commercially impracticable because this narrow limit made the prices of the small bearings out of proportion with those of the large.

Mr. Gray called attention to the fact that the tolerances for the bore of the races are wider than those absolutely necessary, but this is done to let all manufacturers in, and the tolerances are greater than usually found in bearings as delivered from the makers. Eccentric tolerances had been said to be too wide, but it was found that 75 per cent. of the bearings are well within the tolerances given. It was stated that the idea all along was to get commercially practicable tolerances. Where closer limits were needed they should be specified as desired.

Discussion brought out a new definition for eccentricity. The eccentricity of the inner race is that lack of running truth noticed upon the stationary outer race when rotating the inner race balls upon two centers. The eccentricity of the outer race is that running truth revealed by a suitable indicator showing the rotation of the outer race and balls upon the inner race fixed upon a stationary arbor. This definition, Mr. Gray stated, was adopted because it follows the method employed in all testing departments for bearings. The end play or actual freedom tolerances were omitted because at present no methods have been devised for measuring it.

President Marmon, in commenting on the report, stated that he was pleased to know that it brought out the practical side of the question. There was no discussion.

New Data Sheets Needed

The Data Sheet Division reported that having only had the matter in hand a few weeks they were not ready as yet to give full results of their work. There are a number of sheets about to be issued and a vast amount of material is on hand from which other sheets will be evolved. It is now practically a year since active work has been done along these lines, but it is promised that the present activities will result in an early issuance of more of the sheets.

The report of the data sheet division created a great deal of interest and was presented by B. D. Gray, chairman of this division as well.

In commenting upon this, Mr. Gray stated he believed that if automobile engineers had one book giving all the data needed for his work, that book would become his bible. And it is the intention of this division to compile a data book which will be the automobile engineer's bible. He called for assistance from the members in general in the compilation of the book, as he was convinced that most of the members have valuable data which have been developed in their work or which they have come across accidentally, and that they owe it to the society to contribute this. It was his earnest appeal to assist in the production of a work which would be a monument to the society.

In opening the discussion President Marmon suggested that the trade periodicals which annually issue specifications of the cars on the market reprint them in data sheet form for the data book. He stated that the valuable material contained in these large issues usually was unavailable when needed because the bulky volume was mislaid.

Henry Souther, consulting engineer of the Standard Roller Bearing Co., discussed the situation of data on physical properties of iron and steel, stating that the situation was somewhat in the dark at present. He brought out that whatever is given in the data book on this question will be only one of the many possibilties in the way of physical properties that may be obtained by different treatments and analyses. That is, the members must not be mislead into assuming that the specifications given are the only possible ones for a given material.

K. W. Zimmerschied, metallurgist of the General Motors Co., stated that the main thing in this difficulty is the edition of the results available and a revision of the specifications of iron and steel.

Henry Souther believes that the data book would be the greatest possible missionary of the standards in the society. That it would be on every draftsman's table in the motor car and allied industries. Similar books too often are out of sight. He stated further that the data book is sure to be resorted to in designing and had a great influence upon the 1915 cars. F. E. Moscovics of the Jones Electric Starter Co., suggested a use of a distinctive color for the S. A. E. data sheets to provide

Group of S. A. E. members who participated in the Tuesday afternoon session of the society

for confusion with those submitted by the trade. He was informed that arrangements for such distinction had been provided for.

To acquaint the manufacturers with the importance of these data sheets it was suggested that a paper be presented on the subject at the summer meeting. Mr. Gray stated that he had in mind the publication of some of the data on blueprint paper for draftsmen's tables, to be supplied at extra charge to non-members.

The Nomenclature report was not presented. In commenting upon it President Marmon mentioned the wail he has heard from his factory for definite names of parts.

The paper on "Necessity for More Special Data for Electric Car Designers," to be read by J. B. Thomas, of the Century Electric Car Co., was presented by Mr. Conant in the absence of Mr. Thomas. A plea was made for more consideration by the standards committee of special needs of electric cars. R. J. Nightingale, Willard Storage Battery Co., suggested a special division, and Mr. Conant moved that such a division be appointed. Robert C. Hull, of the Gould Storage Battery Co., and David F. Tobias, of United Electric Light and Power Co., both urged co-operation with the Electric Vehicle Association. Mr. Conant's motion carried, and President Marmon stated the new division would be instructed to work with the Electric Vehicle Association.

H. G. Chatain, of the General Electric Co., made a plea for thorough investigation of the fuel question and advocated the drawing up of specifications by which fuel could be purchased, stating that the Beaumé scale was totally unreliable as a guide. He also showed that the best fuel could be obtained by certain specifications at less cost than the nondescript gasoline obtained under the present system. Incidentally he stated that benzole is a fuel which fulfills these requirements and broached the news that the Tennessee Coal and Iron Co. had built a factory and was in position to produce benzole in quantities. In commenting upon this President Marmon mentioned regretfully the present fuel division of the standards committee and ventured that if the drawing up of a set of specifications would save 2 or 3 cents a gallon on fuel it was well worthy of the society's efforts.

Treasurer Hermann Cuntz announced that the work of the historical committee has been favored by two endowments of $100 from T. J. Fay, past president of the society, and Christian Girl, Perfection Spring Co. The idea is to gather together the relics of the automobile industry and to instal them in a suitable place. The committee promises an interesting report on its work in the not far distant future. It is planned to carry this work to a point where a highly creditable museum will be formed.

Nomenclature and Broaches Division

Nothing was done on the Nomenclature Division on account of the absence of its chairman, E. J. Stoddard. The report was referred back to the committee for report at a later meeting.

The Broaches Division report, which was read by C. W. Spicer, the chairman of this division, brought out some little discussion on the changes which have been made in these specifications. It was pointed out that it is unnecessary to put a radius on the outer edge of the broach tooth and that furthermore the manufacturing costs of so doing are prohibitive. In comparing the work of the committee with the previous tables drawn up it was shown that the tables had to be altogether changed to meet the condition of taking the nominal diameter as the measurement across the splines. The report which was forwarded to the society at large follows:

> Within the last year or slightly more, the matter of applying a hobbing machine to multiple-spline shafts has come to the front for serious attention. It appears to be definitely determined that especially for six or more splines the hobbing process is an important step in advance from the commercial production standpoint; and the importance increases with the number of splines. It therefore seems wise that this feature should be taken into consideration when studying any new data on the subject of multiple splines.
>
> It appears from careful study that some proportions of multiple spline shafts now in use can have the splines developed by the hobbing process, whereas other forms also in use cannot be developed by that method. It seems therefore that any recommendations as to accepted practice or standards should be such as to permit of manufacture by the hobbing process.
>
> Standards committee recommendations were as follows:
>
> (1) That in the six-spline shaft the splines and grooves should be as nearly as possible of equal width, that is, the outside circumference of the six-spline shaft should be spaced into 12 approximately equally divided divisions.
>
> (2) The design should be such that so far as possible the same broaches can be used for developing different required depths of splines.
>
> (3) That the nominal diameter in all cases be taken as the outer diameter of the shaft.
>
> Inasmuch as shrinkage cannot be controlled by any recommendation, as distortion of the parts will vary very widely with the heat treatment and shape of the piece, it was decided by the division that it would be impossible, at least at the present state of the art, to standardize anything but the soft broached holes and the tools for making them, and that the individual automobile engineer will have to determine for himself the proper allowances to be made on the shaft to give the required results.

Mr. Spicer dwelt on the desirability of standardizing broaches and of reducing the number of different broach measurements and specifications. Considerable discussion took place on the feasibility of grinding the broach holes, and in the opinion of the majority it is sufficient to grind the smaller diameter of the broached hole. The difficulty of grinding the square holes is so great that it cannot be accomplished on a commercial basis.

J. N. Heald stated that the transmission was only one division of the broaching problem and that in this case a small amount of rotational motion does not make any difference between the shaft and the gear, but on the propeller shaft, if play of that nature existed, a pronounced knock would result.

A general discussion on the grinding work followed and it seemed to be the sense of the meeting that it should not be carried into the squared hole. The report of the division was accepted.

After the acceptance of the report Mr. Spicer asked if it was the wish of the society that the committee investigate the four-spline shaft. President Marmon stated that it was his belief that this should be examined, as there are numerous instances of its use throughout the industry and that standardization in this would be valuable. It was therefore referred back to the standards committee.

Chairman Kennedy, of the Truck Standards Division of the

standards committee, read his report on the Truck Standards Division work. The division, through its chairman, reported that while some conclusions had been reached on various truck fittings, the report on the tires was the only part ready for acceptance. A digest of this part of the report follows:

The Truck Standards Division report showed considerable progress in the way of wheel diameters, and the discussion showed a practical unanimity of opinion on the recommendations as far as they went. W. P. Kennedy, chairman of the division, reported that only one recommendation was ready to be presented at the coming meeting, and that was to reduce the future truck wheel equipment to two, having nominal diameters of 36 and 34 inches. After considerable discussion whether or not this met the requirements, it was decided to change the recommendation to read three sizes, 36, 34 and 32 inches. Evidence taken from reports by tire companies on this matter showed that only about 1 per cent. of the tires turned out are of the 32-inch size, but that there is a great tendency to build trucks in the 1,000-pound class that will require that size of tire.

Truck Standards Division

Although the Truck Standards Division has had under consideration several projected possibilities for recommended practice, it is prepared to offer at this meeting only one recommendation as follows:

"That the varieties of wheel diameters in the future equipment of motor trucks be reduced to two, having nominal diameters of thirty-two, thirty-six and forty inches."

The motives prompting this recommendation are fundamentally economic, based upon the substantial reduction to be effected in tire, wheel and vehicle cost, as well as the collateral reduction in operation cost, as made evident by our investigations. We believe that the commercial advantages to be derived by those interested in exploiting motor truck application, are of such value as to warrant any compromise of an engineering character which may be involved in compliance with the practice recommended.

It may become advisable to add to these sizes another, probably thirty-two inch, diameter, but a review of current practice does not indicate any special demand for this at the moment, and we are of the belief that the present large employment of thirty-four-inch diameter is principally influenced by cost, and that with the anticipated lowering of cost resulting from the recommended practice, the thirty-six-inch will be employed by preference.

We also propose to recommend later the adherence to two diameters, possibly sixteen and twenty inches, in industrial truck equipment, and further hope to determine upon the limitation of sizes employed with motor fire apparatus.

As indicating the scope of our present research in the direction of further truck standardization possibilities, we subjoin several tentative reports covering the work being conducted by our sub-committee on equipment.

The report of the committee on wheel sizes was accepted.

Subject of Fenders Introduced

President Marmon introduced an added topic in the way of life-saving fenders for commercial vehicles, and John Younger, of the Pierce-Arrow company, read a paper on the subject. He pointed out the importance of the society's doing something in the way of taking care that a good engineering job is done on that kind of work. Mr. Younger spoke of the present legislation now in force in Detroit, Chicago and Cleveland as examples of the tendency in the direction of laws which are framed without a mature consideration of the subject.

He mentioned the fact that in Detroit many of the fenders on the trucks are patched and held together with pieces of wire and other makeshift devices. Some extracts from the report of the public service commission were given, which showed that this body is active in securing data on the accident preventions which can be laid to the work of the fenders.

Mr. Younger pointed out that there is a wide degree of difference between the requirements of a motor truck and a trolley car as far as fenders are concerned. With a trolley it has been shown that it is necessary to have the fenders scraping the ground, but on a truck it is impossible to do this, due to the inequalities of the ground over which it is required to travel.

Another question in the way of truck fenders is the matter of width. Mr. Younger pointed out that it would require 13 feet to adequately protect the wheels of a truck, and that this width is so great that it would prove an enormous difficulty in traffic. In turning a curve the front end of the fender not only projects on the outer side to a great degree, but, unless the fender is of enormous width, the inside wheel is left without a guard. He further stated that the London General Omnibus Co. went thoroughly into this matter, even going so far as to advertise for a good fender design. More than 4,700 replies were forwarded, and out of these there was only one seemingly practical design, and that was discarded after service tests. This scheme was the use of a rubber wheel bearing against the regular vehicle wheel, which would turn in an opposite direction.

R. McK. Lloyd read a communication expressing his ideas on the subject which can be summed up as an expression of doubt that any of the devices now in use for this purpose could be used on motor trucks. A. J. Myers stated that he did not expect to see a decrease in the number of accidents due to the use of fenders. He also mentioned the psychological phase of the situation in that the driver who was inclined to be careless without the fender would be still more so if he thought that there was a good chance of escaping serious consequences of reckless driving. A. J. Slade stated that he saw serious objections to fenders in the added overall length and width.

Comments on Truck Papers

Then followed a symposium on the final drive for motor trucks, introduced by Arthur J. Slade, consulting engineer, with special papers as follows: "Internal Gear Drive," by V. V. Torbensen, Torbensen Gear and Axle Co.; "Double Reduction Live Axle," by B. B. Bachman, the Autocar Co.; "Worm Gear," by John Younger, Pierce-Arrow Motor Car Co., and "Chain Drive," by H. D. Church, Packard Motor Car Co. This evolved spirited discussion, Frank Burgess, Boston Gear Works, taking up the advantages of the worm drive as a whole and the Hindley type in particular. He stated that the efficiency of the worm made it the coming drive, and its general adoption is only a matter of development. The fact that electric pleasure vehicles are adopting the worm shows its lightness and efficiency. The large number of parts of the chain he believed to be against that form of drive as the eventual one, and the satisfaction it has given is due to the good workmanship of the makers. He stated his conviction that the worm is the future drive for power in general, and to support this pointed to the locomotives on the Panama Canal and the products of the Otis Elevator Co. Burgess concluded by saying that makers should not throw down the worm on account of its infancy, though he is in sympathy with the manufacturer who hesitates on account of its newness.

Mr. Meyer stated that his tests have shown the efficiency of the double chain drive to be generally underrated; that this was as high as 70 to 80 per cent. The success of the maker depends upon how well he meets his problems. Mr. Alden, of the Timken-Detroit Axle Co., believed it too early to say what the eventual drive would be, but stated that since his company started offering worms for trucks the worm was putting the double chain on the shelf in the classes where an option was offered.

It was his belief that there was very little difference in comparative weights, but under 2 tons capacity the advantage is in favor of the worm. The relative cost looks as though the worm would be cheaper than the double chain drive when the volume of business became the same. He took exception to the statement made by Burgess in regard to the influence of ball bearings on bevel drive development.

In reply to a question as to how the whipping of the long shaft with worm drive was obviated in the Pierce-Arrow trucks, Mr. Younger stated that it is impossible to use a single propeller shaft with a universal at each end where the wheelbases are long. On the trucks referred to a third universal divided the shaft into two parts. R. McK. Lloyd, International Motor Co., suggested further separation as to sizes in electrics, and stated it as his belief that the electrical engineer must consider the drive problem from a different angle than that of the gasoline engineer.

H. L. Pope, Pope Mfg. Co., suggested that the field of operation must be considered in determining the drive, that for one thing axle clearance must be watched.

Electrical Equipment Division

The Electrical Equipment Division report is to be presented at the general meeting. The discussion on this report brought out the fact that the report is so designed as to take care of all batteries regardless of the number of cells of which they are composed. Should higher voltage lamps than the 6-volt type be used this will not affect the results attained by the standards committee since the specifications are given on a per cell basis.

A digest of the electrical division report follows:

Electrical apparatus for use on gasoline automobiles, when operated on circuits of from 6 to 25 volts, shall be capable after installation of withstanding for one minute an alternating potential of 500 volts, the test being applied between the conducting circuit and frame or ground. In the case of apparatus with one terminal grounded, the ground connection shall be removed at such a point as will permit the test being applied to all parts of the circuit which, in actual use, will be subjected to working potential.

Howard Marmon, who retires from the presidency

Exception—Batteries will not be subjected to any insulation test above their working potential.

The overall width of the battery, measured from side to side of case, shall not exceed 7½ inches.

The overall height of the battery measured from bottom of case to top of handles shall not exceed 9½ inches.

The overall length of the battery, measured from end to end of case, including handles, shall vary according to the capacity of the battery and its details of design. Handles shall, as standard, be placed at the ends of the battery, and provision for hold-down devices shall, as standard, be made at the ends of the battery. The space occupied by such handles and hold-down devices shall be in the direction of the length of the battery only, and not in the direction of its width. Terminals and connections shall not extend above the handles; the latter to be the higher point.

Lighting batteries shall be rated at the capacity in ampere-hours of the battery when discharged continuously at a 5-ampere rate to a final voltage of 1.8 per cell, the temperature of the battery beginning such discharge being 80 deg. F.

Batteries for combined lighting and starting service shall have two ratings, of which the first shall indicate the lighting ability and be the capacity in ampere-hours of the battery when discharged continuously at a 5-ampere rate to a final voltage of 1.8 per cell, the temperature of the battery beginning such discharge being 80 degrees Fahr. The second rating shall indicate starting ability and shall be the rate in amperes at which the battery will discharge for 20 minutes continuously to a final voltage of not less than 1.65 per cell. The temperature of the battery beginning such discharge to be 80 degrees Fahr.

The leading comment on this paper was whether or not the specifications standardized by the S. A. E. should not be identical with those presented by the I. A. E. E. A copy of the latter reports was read and a number of differences pointed out.

Mr. Palmer stated that the meetings of the electrical equipment division had been attended by representatives of the A. I. E. E. and that the latter had been in accord with the recommendations made by the electrical equipment division.

Coker Clarkson stated the I. A. E. E. were changing their recommendations for this line of work and that it would be some months before any action will be taken by them on this work. There did not seem to be any difference of opinion between the representatives of the two societies, and in fact members of the different fire insurance organizations were present and concurred in the S. A. E. deliberations.

Alden L. McMurtry stated that in his belief these recommendations appeared at an opportune time on account of the poor insulating jobs on many of the accessories now on the market.

Mr. Palmer stated that the committee feels that the standardization of battery dimensions is a step towards greater things in this direction and expressed the idea that the committee might move ahead on this work.

F. R. Hutton stated that it was generally understood that a committee should move on and allow the standardization work to keep pace with the growth of the industry. President Marmon agreed with him in this and stated that this was the case with all standardization committees.

Mr. Brown said that the heading on the rating data should read lead batteries instead of merely batteries as the specifications did not fit the Edison as they read in the paragraphs on ratings. Mr. Palmer agreed with Mr. Brown on this and moved that this substitution be made. This was carried.

A discussion on the single and double wire systems did not lead to anything definite, because the exponents of both types of wiring were evenly divided. Mr. McMurtry stated that in his opinion the committee liked the single wire system, but that they were afraid of it. He stated that it was a matter of importance at the present time, as there were many dealers who carried a stock of both single and double wire lamps, in stock, and that they were placed at a disadvantage.

W. G. Wall spoke in favor of the two wire system, giving as one reason Mr. McMurtry's statement that the insulation work on the small accessories is poor and that consequently damage can be done by them, if the two-wire system is used.

Mr. Brown moved that the report be accepted as it stands with the addition of the word lead before batteries. This version was adopted. Following the adoption of the report, a motion was carried to have the standards committee get out a standard base for lamps.

Coker Clarkson, Prof. Gallup, H. L. Pope, Howard Marmon and C. B. Brown

W. H. Conant on Storage Batteries

W. H. Conant, of the Gould Storage Battery Co., in presenting his paper on the Rating and Size of Storage Batteries for Gasoline Automobiles, stated that it was intended to come between the catalogs and the textbooks on the subject. The paper follows:

A comprehensive treatment of the storage battery is given in W. H. Conant's paper, in which he states that storage battery theory is more a matter of chemistry than electricity. Those educated and trained in electricity should not be necessarily expected to understand the subject of storage batteries without some training in chemistry.

The paper treats almost exclusively the lead-acid type of battery, it being pointed out that this is the prevailing kind in use today. The nickel-alkaline potash type of battery is also touched upon. The paper deals first with the cell parts which are the positive and negative plates and the sulphuric acid as the primary parts and the separators, connecting straps and containing-jars as the secondary. These six parts when assembled form a cell and any number of cells constitute a battery.

There are always an odd number of plates per cell. One more negative is used so that the two outside plates are negative. Separators are either wood or rubber and frequently both. Connecting-straps, or bus-bars, are usually of pure cast lead, milded for the particular shape desired, while connections between plates are made by burning or bolting the joints. The former is far preferable because of the corrosive effect of battery fumes on contact surfaces, which is always to be observed to a greater or less extent even though the contacts are reasonably tight.

For different classes of service, the plates may be differently constructed. The paper treats, however, of the automobile service type only:

The foundation of a plate, whether positive or negative, is a cast frame-work called a Grid, composed of pure lead with a stiffening alloy of antimony. This is designed with a view to (1) mechanical strength, (2) conductivity and (3) ability to properly retain the material with which the grid is filled. This latter is known as Active Material, a paste differently consti-

tuted for the two opposite plates. Positive plates are filled with a mixture of lead oxides, such as litharge, red lead, etc., and certain substances to give it proper body and cohesiveness. Negative plates are filled with a paste made of pure, spongy lead, a physical modification of metallic lead, also mixed with proper binding chemicals. The distinctive difference between the plates in appearance is that the positive has a reddish brown color and the negative a slate gray.

Pure sulphuric acid, which has been so manufactured and refined as to eliminate any metals or salts, is diluted to approximately one-third (by weight) of its original strength. This solution is called Electrolyte and is of equal importance in the storage battery to that of the plates themselves.

The action of these three parts (positive plates, negative plates and dilute acid) is brought about electrolytically. Starting with the cell in a discharged condition, both plates are coated with lead sulphate. When the current of electricity is passed through the cell, positive-plate sulphate is changed to peroxide of lead and negative sulphate to pure, spongy lead. This action is called Charging and, when completed, removes all sulphate from the plates by the electrochemical process of converting it into other compounds. When a battery so charged has its external circuit closed either by connecting electrical devices in the circuit or by bringing the two poles in contact, the opposite action takes place and is known as Discharge.

Every lead cell has a nominal voltage of 2.0. This is known as the open-circuit voltage. When a cell (or battery) is being neither charged nor being discharged—disconnected from either a source of current or a device for consuming power—it is in a state of "open circuit." The voltage at such times has no practical value whatever, contrary to the fairly general impression. The actual open-circuit voltage is, however, usually higher than 2.0, depending on acid density, temperature and state of charge or discharge.

This nominal voltage is valuable only in determining the number of cells required for use in connection with any given piece of apparatus. Cells are almost universally today connected in series; i.e. positive terminal to negative terminal, positive to negative, and so on indefinitely. So the number of cells used, times the nominal cell voltage (2), gives the battery voltage. *Every* lead cell, regardless of size, has the *same* voltage. Increase in size, either in number or size of plates, affects only the capacity. To increase the voltage, cells must be added.

Losses Due to Voltage Difference

Aside from cell or terminal voltage, there is frequent occasion to consider positive and negative voltages separately. These are observed by means of a neutral electrode, usually Cadmium. A piece of this metal is dipped into the electrolyte and a voltage reading taken to the positive and to the negative group. On discharge, positive-cadmium voltage is always higher than that of the cell. Cell voltage on *discharge,* then, is the difference between the two cadmium readings.

Losses in the storage battery are due chiefly to the differences in potential between charge and discharge voltages. Almost from the outset, there is a difference of 0.25 volt per cell, which increases as the curves diverge, until it reaches 0.5 or more. One charge and one discharge, regardless of length, constitute a cycle. If short cycles be taken at low rates, the differences in voltage will be small and the efficiency thereby increased; the longer the cycles and the higher the rates, the lower the efficiency will be.

The other loss which goes to make up the total, is that due to the longer time required for charging as compared with discharging. This loss is much smaller and, if it were the only one to contend with, would permit of interesting results. Ampere hour efficiency varies from 87 to 93 per cent. and in some cases runs as high as 95 per cent. Watt-hour efficiency, however, varies from 60 to 80 per cent. and represents the real value of storage batteries.

The effect of temperature on battery action is very marked. High surrounding temperature during discharge makes for greater capacity than low temperature, even with the same quantity of charge. Warm batteries are, therefore, more efficient than cold. An interesting situation occurs in the case of a battery charged in a cold place and discharged in a warm one, for it is entirely possible to obtain a greater output than the previous input.

For the acid densities employed in storage cells, temperature increases on charge and decreases on discharge. The latter statement must be qualified by saying "at normal rates"; if a cell be discharged abnormally, the temperature will rise, and at extremely high rates, very rapidly. Suffice it to say that there are both chemical and physical reasons for this action.

No permanent damage is done to batteries by low temperatures. Solutions of the specific gravity in question will not freeze in any weather we experience. It might be well to qualify this statement to include only *charged* batteries, which would require temperatures ranging from 30 deg. to 95 deg. F. to freeze. Discharged batteries, or those which may have been considerably diluted, will freeze at points corresponding to their proportion of water. A solution measuring 1.125 will freeze at about 10 deg. F.

Damage frequently results, however, from high temperature. This is probably the greatest single cause of trouble in storage battery practice. It may be said in a general way that high temperature, strong acid and over-discharge are the three principal enemies of accumulators, and rank in importance in the order as given. Lead is not soluble in dilute, cool sulphuric acid, but in either strong or warm acid is attacked. Both plates are susceptible to warm acid and are injured by high battery temperatures. It is well to keep the electrolyte always below 100 deg. F., but as this is frequently impossible in summer weather, 105 deg. F. has been set as the safe maximum by manufacturers of batteries.

Internal Resistance Not Considered

The matter of internal resistance is one that needs be given no consideration by those for whom this paper is intended. This factor is a known quantity of negligible amount, compared with other more important features of battery practice. It amounts, roughly, to 0.03 ohm for small cells, varying with the plate area exposed and the separation.

At some future time, large buyers of batteries will subject the constituent plates to as careful scrutiny and analysis as they do now metals for mechanical parts of motor cars. The differences between good plates and others begin in the earliest stages of their manufacture. All grades of lead oxides may be used where quality is not the desired end; careless work may be done in the molding of grids; poor contact may be established in filling grids with paste; hurried processes may be tolerated when "forming" the grids thus pasted into finished plates; and many other corners may be cut that will not show until long after the batteries are placed in service. Even then it requires the chemist or expert to trace back from effect to cause, so involved are some of the resulting chains of action.

In commenting upon the statements made above, Conant regretted deeply the fact that there was a strong tendency toward hiding the battery under the seat, or under the body, where it was out of the way, but unhandy to get at. This he believed was due to the present effort toward streamline bodies, clean running boards and other catalog talking points; but it had the effect of causing the battery to suffer for the want of proper care.

Batteries, he believes, are too vitally important to be put away, where they will be neglected. With new electrical devices every season, ignition, lighting, starting, horns, gearshifts, foot-warmers, cigar lighters and so on, all operating on the battery, enough attention is not being paid to the size of the battery. The purchasing department has too much to say as to size.

In the discussion, W. G. Wall, National Motor Vehicle Co., stated that the popular demand for clear running boards necessitates another place for the battery.

William L. Marsh, representing United States Light and Heating Co., here entered objections to the standards committee report on battery sizes, stating that the dimension limits given would be prejudicial to some installations, as would the specifications, as to handles and terminals. Also if the 5 ampere rate be adopted the final voltage specified should be 1.7 instead of 1.8 per cell and the standard temperature should be specified at 70 degrees, because that is the standard temperature adopted.

W. H. Conant points out some storage battery facts to G. G. Milne, W. H. Gould, W. H. Roberts and R. C. Hall

Ford to Distribute $10,000,000

Stupendous Scheme for Sharing 1914 Profits with Employees—Means Minimum Daily Wage of $5.00—Three 8-Hour Shifts Replace Two of 9—4,000 More Employees

DETROIT, MICH., Jan. 6—*Special Telegram*—An announcement of the greatest economic importance ever made in Detroit was given out by Henry Ford, president, and James Couzens, vice-president and treasurer of the Ford Motor Co. on Monday, January 6. The plan involves the distribution to employees of approximately $10,000,000 on a profit-sharing basis, commencing January 12, 1914. This will be participated in by all male workers of the entire Ford organization, who are over 22 years of age and also by the younger men if they can show that they have wives or mothers dependent upon their support. This $10,000,000 is the estimated profit to be divided among the workers for 1914 and its allotment will take place in proportionate amounts at each semi-monthly pay day instead of in a lump sum at the end of the year. With the share of the profit which each man will receive the minimum wage at the factory, which is now $2.34, will be raised to $5.00 a day. All but about 2,000 of the workers here will at once share in the profits. This is 10 per cent. and includes the men under 22 and the women employees.

Adds 4,000 to Payroll

Another feature of the plan is the change from two 9-hour shifts to three 8-hour shifts per day at the Detroit plant. In order to carry out this program 4,000 to 5,000 new men will be taken on. As in every automobile plant there is a slack season, it has been planned to work out the production program so that the dull season will come during the months of July and August, and Mr. Ford expects to make arrangements with the Michigan farmers so that those men whom it is necessary to lay off during this period will find temporary employment on farms. Thus the farmers will be helped in solving one of their greatest problems, that of lack of hands at harvest time.

The women and girls employed in the offices and various plants of the Ford organization will not be included in the profit-sharing, but will be taken care of by an increase in wages. Besides the large number of women employed in the offices, there are a number employed in the electrical department of the Detroit plant. Although no definite statement could be made from the offices of the Ford company, as to plans for increasing the number of women employees, one of the officials of the company said that an increase in all the departments there would undoubtedly involve a substantial increase in the number of women employed.

The reason given for not including this class of workers in the profit-sharing plan, but forwarding their personal interests through raises in pay, was that they did not enter so vitally into the economic scheme, as do the men who are the heads of families.

Ford's Philanthropic Idea

The following is taken from Mr. Ford's statement:

"We believe in making 20,000 men prosperous and contented rather than follow the plan of making a few slave drivers in our establishment multi-millionaires." In explaining the move Mr. Ford and Mr. Couzens say that the plan is one of social justice. The employees will not be subject to preemptory discharge by the foreman; but in case a foreman feels that a man is unfitted for work in his department he will be transferred to another department until it is definitely established that he is entirely inefficient. Along this line a new department will be created, known as the sociological department. Just what the duties of this department will be, cannot at this time be definitely stated, but its functions will be very broad. Not only will it include the work of transferring or placing men in the departments in which they are most efficient, but it will also look to the conduct of the men outside of working hours. It will attempt to guide these men so that the new prosperity will not result in their own injury. If a man cannot be brought to a realization of his economic duties there is no question but that after a reasonable trial his place will be given to a man who will realize his responsibilities to his family and the community.

The number of men now employed at the plant is about 15,000 and with the 4,000 men to be added immediately and the 7,500 now employed at the various branches and assembling plants the total number of Ford employees who will come under the profit-sharing measure will number over 26,500, on February 1. It is stated from the Ford offices that the plan will be worked out throughout the whole Ford organization, which will include the branch houses, and assembling plants throughout the country.

The general manager of the Ford Motor Co., Ltd., Walkerville, Ont., Can., could not, however, make a statement at the present time as to the operation of such a plan in the Canadian organization, as they had not yet taken the matter up. This Canadian plant is in reality a separate organization from the American company, being made up, in part, of entirely different stockholders. The Canadian factory at Walkerville and the branches in the Dominion now employ approximately 15,000 men.

Mr. Couzens states that the extra money to be distributed under the plan will not come from a raise in price of Ford cars, but on the contrary, the company will continue to follow its policy of reducing the price of its product whenever it is possible to do so. The amount of the profits to be divided among the workers will be subject to changes from year to year depending upon the prosperity of the company. The working out of the plan will affect the low price to the greatest extent and it is Mr. Ford's hope not only to attract the best mechanics to his plant but to put those who most need help in a position where they can become of real economic value to the community.

Sets Detroit Agog

The move has caused a great deal of discussion in Detroit, some feeling that there will be a wave of discontent among workers throughout the city. Mr. Ford, however, does not believe in the theory of economics that no such plan of bettering conditions can be successful until a universal movement has taken place. He believes that although some changes in the plan will undoubtedly have to be made, in perfecting it, he has taken a step in the right direction. He hopes that others will be able to follow his lead. In commenting on the situation Frederick A. Tilton, manager of the auditing department of the Security Trust Co., Detroit, said in part: "The action of the Ford company in making so large a distribution of its profits is another example of the altruistic spirit of its genius, Henry Ford.

"I would not appear as adversely criticising his generous tendencies. To few men is such opportunity, and I may add, responsibility given, and the impulse to share with their fellow is seldom so effective. So far as being an example to others, my experience in examining the finances of hundreds of concerns enables me to say that, save in one case out of every hand, the element of net profit is so small either because of competition or other business hazards, that the slightest increase in wages affects very vitally the amount of profit and any radical increase, voluntary or forced, would so undermine the average business that it would be bankrupt."

10,000 Apply For Work

Andrew Green, general manager of the Solvay Process Co., praises the Ford move. He tells of a profit-sharing plan which has been in successful operation by his company for a period of three years. This plan gives a profit to all salaried men. Those working by the hour received 2 per cent. of their earnings at the end of 2 years service, 3 per cent. at the end of 3 years and so on until maximum of 6 per cent. is given.

The new announcement brought some 10,000 men looking for work at the plant on Tuesday morning. The company, however, gave out that no men would be hired that day and although the mass of job seekers was sorely disappointed the crowd dispersed in a very orderly manner. The Ford company states

that it will continue to follow the policy in force all winter of giving preference to married men and those in real need of employment.

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WASHINGTON, D. C., Jan. 6—*Special Telegram*—A "Social Advance" and a "Recognition of the Value of Men in Industry," were Secretary of Commerce Redfield's characterization today of the Ford Motor Co.'s plan to distribute a $10,000,000 melon to employees. "Some people will say Ford cannot afford to do that," said the secretary. "That kind of talk is foolish. I see in this as in the removal of Morgan members from directorates, a great step forward. It is a social advance, recognizing the value of men, which may be, and I hope is, epochal. One must not discuss the details of such a plan because this may only be done by one who knows the details of the business, but the broad principle involved of recognition of the essential value of men, and the equity of appraising that value at its true worth is entirely sound."

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France Offers $12,400 for Best Kerosene Automobile Motor

PARIS, Dec. 27—France is making a strong effort to encourage the use of kerosene on automobiles, and particularly for commercial vehicles. A competition has been anounced, with $12,400 in cash prizes for the most efficient kerosene motors applied to road vehicles. The first prize of $10,000 and the second of $2,000 are offered by a petroleum syndicate, and the third prize of $400 is given by the Association Générale Automobile, an auxiliary of the Automobile Club of France. The latter will have charge of the trials.

The competition will open on October 1 at the new laboratory of the A. C. A. Motors must have four cylinders of 20-30 horsepower, weighing not more than 33 pounds per horsepower, everything included except fuel and oil and their tanks. There will be four economy tests on the bench, as follows: 3 hours under full load: 3 hours under half load at the same engine speed as under full load; 2 hours at half speed; 2 hours running light at same engine speed as under full load. Close record will be kept of the amount of fuel consumed during these four tests. Gasoline will be allowed for starting, on condition that it is not contained in a special tank. In no case must starting operations occupy more than ten minutes. Having undergone these preliminary trials with a fuel consumption of less than 350 grams per horsepower hour, and having made no repairs, the motors will be qualified for the final test on the road.

Each motor will be fitted into a chassis, the total weight of the vehicle to be not less than 2,645 pounds, without driver, fuel or oil. Four days will be spent on the road, the cars covering a distance of 621 miles at an average speed of not less than 19 miles an hour. Failure to maintain this average will entail disqualification, but no advantage will accrue from a higher speed. During the road tests no repairs can be made to the car, and at the end of each day's run it will be locked up. Note will be taken of all stops, of difficulties in starting, of the use of gasoline for starting, of overheating symptoms, of breakages, if due to engine vibration, and of any fouling of the plugs and valves. Total fuel consumption on the road will also be noted.

Regularity of running will be considered while on the road, points being awarded from 0 to 20, and consideration being taken of the quantity of gasoline employed for starting purposes. The winning engine will be the one having shown the lowest fuel consumption and proved the most regular on the road.

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Kennerdell to Head A. A. A. Contest Board

NEW YORK CITY, Jan. 7—Richard Kennerdell was appointed to the chairmanship of the Contest Board of the American Automobile Assn., at the meeting yesterday of the Executive Board, succeeding Wm. Schimpf, who has served in this capacity for 2 years and who declined the renomination.

Mr. Schimpf, always an ardent enthusiast, has been closely in touch with racing for many years. Before he became chairman of the contest board, he served as a member of that body and prior to that time was president of the Long Island Automobile Club, and also chairman of that club's contest committee.

Mr. Kennerdell is from Franklin, Pa., is an enthusiast in contest matters and once figured as something of a cyclist, and has been a pioneer motorist since the introduction of the self-propelled vehicle. He is in position to do considerable traveling and expects to attend the most important race meets in various parts of the country.

The meeting of the Executive Board was the first to be called by the newly elected President Wilson and was well attended, over a score being on hand. Several ex-presidents of the A. A. A. were included.

Among the business transacted was the empowering of the National Good Roads Board to hold a Federal Aid Conference in Washington in connection with National roads legislation. A committee was appointed to prepare for a mid-summer meeting of the association to be held in the White Mountains, and members generally will be invited to tour to that gathering. The committee consists of L. R. Speare, S. A. Miles and A. G. Batchelder. They are empowered to add to their number. The Ohio State Automobile Association was also asked to name a director-at-large to succeed Dr. A. B. Heyl, who was dropped as a member of the Board of Directors.

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Gets Grand Prize Sanction

NEW YORK CITY, Jan. 7—Announcement has been made by Leon T. Shettler, vice-president of the Western Automobile Assn., which will conduct the two classic races, Vanderbilt and Grand Prize, that H. B. Anderson, president of the Automobile Club of America, has given the sanction for the Grand Prize race. As announced, exclusively by THE AUTOMOBILE, of November 27, 1913, the races will be run on February 21 and 23, the Grand Prize on the latter date.

According to the tentative agreement between the Western Racing Assn., and Mr. Porter, representing the Motor Cups Holding Assn., the Vanderbilt race will be for cars of 600 cubic inches and under, and with a course approximately 300 miles. The Grand Prize will, as heretofore, be a free-for-all, but with the distance the same as the Vanderbilt. In both events there will be nominal entry fees of approximately $250. The prizes will be $8,000 in each race divided as follows: $5,000 first; $2,000 second and $1,000 third.

It is expected that the A. A. A. will shortly sanction the Vanderbilt event.

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Philadelphia Speedway Looks Favorable

PHILADELPHIA, PA., Jan. 3—So favorable is the outlook for the successful completion of the automobile speedway planned to be constructed just above Willow Grove, Pa., that its optimistic promoters and organizers are talking of a 500-mile endurance contest to dedicate the track on Labor Day next fall.

The present status of the project is this: Several hundred subscribers of the Speedway Association have already been secured, it has been organized under the laws of Pennsylvania, a charter has been granted by the Bucks county court and land sufficient to accommodate a track 2 miles in circumference has been secured.

The officers of the association are: Henry C. Dunlap, of Philadelphia, president; Charles L. Hower, of Johnstown, Pa., secretary, and Paul Jones, of Jenkintown, treasurer.

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Hughes Completes Cyclecar Trip

NEW YORK CITY, Jan. 7—Hughie Hughes, driving a Zip cyclecar, arrived here today, completing a run from Chicago, with the exception that the car was shipped from Ashtabula, O., to Albany, because the car could not negotiate the deep snows encountered between these points. The car left Chicago Christmas day and its average running time for the trip was 16 miles per hour. From Chicago to Toledo, a distance of 289 miles only 7 gallons of gasoline were used. This is an average of 41.3 miles per gallon. The car is on exhibition at the Palace. There were no mishaps and no parts broken, according to the driver.

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Blizzard Held Up Cyclecar Trip

NEW YORK CITY, Jan. 5—The overland trip of the Imp cyclecar from Detroit to New York ended at Erie, Pa., yesterday, on account of the worst blizzard northern Pennsylvania has had for several years, according to the report of W. B. Stout, of Chicago, who reached this city today. Fences were buried under 4 feet of snow, wires were down, and, of course, the roads were impassable.

Stout was making the Detroit-New York run in the Imp to determine whether the little narrow tread, friction and belt drive vehicles could be depended on to navigate rough and muddy roads as well as their larger brothers of more power. The cyclecar left Detroit December 30 and arrived at Erie, 280 miles away, after 5 days in less than 36 hours running time.

In spite of the fact that the car was shipped back before the completion of its scheduled trip, the car made an exceptional showing. It is in as good condition as at the start.

Lovell-McConnell Wins in Horn Suit

Auto Supply Mfg. Co. Restrained from Manufacturing Newtone and Motophone Electric Horns

Hartford Suspension Co. Files Suit Against a Dealer Selling Gabriel Rebound Snubbers

NEW YORK CITY, Jan. 6—Today Judge Chatfield, of the United States District Court for the Eastern District of New York, handed down a decision in the suit of the Lovell-McConnell Mfg. Co. against the Automobile Supply Mfg. Co. The suit is on the Klaxon makers' basic patents Nos. 923,048, 923,049, and 923,132, granted May 25, 1909, which were alleged to be infringed by defendants, who were makers of the Newtone and Motophone automobile horns.

The opinion is a record one for length in that it comprises some eighty-six pages of typewriting. Complainant's counsel, George C. Dean, says "The decision is sweepingly in favor of the Klaxon patents and sustains us on all points. It holds that all claims in suit are valid, and that they not only cover the defendant's Newtone horns, but also the other 'commercially useful and valuable forms of this kind of signaling apparatus.' This decision will be of great interest throughout the automobile trade as it exactly covers a number of other infringements against which we have now pending suits for infringement of the same patents."

Appeal Ball Bearing Decision

NEW YORK CITY, Jan. 6—Papers are now in course of preparation by the attorneys representing the Hess-Bright Mfg. Co., in which an appeal will be made on the decision rendered last week in favor of the F. & S. bearing interests as defendants in an infringement suit. This will come up in the Court of Appeals in the Third Circuit, Philadelphia, Pa., in about 3 days.

Hartford Sues Gabriel Snubber Dealer

BUFFALO, N. Y., Jan. 6—Shock absorber patent war is portended between Truffault-Hartford interests and the makers of Gabriel snubbers. Edward V. Hartford, president of the Hartford Suspension Co., filed Saturday in United States District Court in Buffalo a bill of complaint against Ralph E. Brown, doing business under the name of Ralph E. Brown Motor Car Co. The complaint charges Brown with selling a shock-absorber which the complainant charges is an infringement on certain patents it holds. The company petitions the court to issue a provisional and perpetual injunction against the Buffalo automobile man. The complaint further alleges that some time ago the complainant brought suit against the Gabriel Horn Mfg. Co., Cleveland, O., through an agent, for infringing on a patent which had been granted J. M. M. Truffault in 1906. An injunction was issued. The claim is now that the Gabriel company modified the Gabriel Snubber and is still an infringer on that patent and also on a recent one granted a few weeks ago to E. V. Hartford. Brown, the bill declares, is at fault in selling the article.

Claims Infringement on Motor Washer

NEW YORK CITY, Jan. 2—Suit has been filed in the United States District Court of the Southern District of New York by A. F. Wagner, of this city, against the B. & L. Auto Lamp Co., alleging that his patent on a motor cleaner, No. 1,067,891, has been infringed. He asks for an injunction.

Discontinue Cases Against Grossman Interests

NEW YORK CITY, Jan. 3—The two cases in the U. S. District Court of the Southern District of New York, William Barber vs. Lowe Motor Supply Co., and C. A. Metzger, Inc., against Emil Grossman Mfg. Co., Inc., have been discontinued without costs to either party. The Emil Grossman Mfg. Co., Inc., as stated in THE AUTOMOBILE for October 30, 1913, has acquired a part ownership in patent 732,032, issued to William Barber, Brooklyn, N. Y., for a spark plug with an insulator consisting of a combination of porcelain and a less fragile substance. This patent was the basis for a suit started by William Barber against the Lowe Motor Supply Co. for selling Red Head plugs. The Grossman company is interested in Red Head plugs, and since it is one of the owners of the patent the suit against the Lowe Motor Supply Co. has been discontinued, as the Red Head plug ceases to be an infringement because of the new interest in the patent.

The Mezger suit involved an alleged infringement of C. A. Mezger's patent, No. 700,147. Mr. Mezger makes the Sootproof spark-plug.

BOSTON, MASS., Jan. 6—Receivers for the Walpole Tire & Rubber Co. recommended in a report to the United States District Court the payment in full of claims amounting to $505,599 out of the $1,680,671 filed against the company by creditors.

MUNCIE, IND., Jan. 2.—Creditors of the Interstate Automobile Company, Muncie, Ind. have agreed that the property of the company shall be sold at a public sale, February 5. The agreement was reached at a meeting held a few days ago by the creditors with Harry C. Sheridan, referee in bankruptcy.

Englebert Tire Prices Lower

NEW YORK CITY, Jan. 7—The new price-list of the Englebert Tyre Co., effective January 1, shows reduced prices. The 36 by 4.5 plain tread have come down from $44.65 to $41.00. The Chevron types of the same size have come down from $50.90 to $47.25. The 37 by 5, plain tread, now costs $50.50, the former price being $55.75. The heavy car and Chevron types of the same size have come down from $62.60 to $59.50.

NEW YORK CITY, Jan. 6—The Columb Tyres Import Co., Inc., this city, has come down 10 per cent. on its Prowodnik tire prices and 5 per cent. on its tubes. The 30 by 3 tires are now $22.50, the 30 by 3.5, $28.35, and the 37 by 5 have come down to $62.15.

Automobile Securities Quotations

There were a few changes of small importance in this week's automobile quotations. Goodyear common rose 50 points, in fact most all of the tire quotations are coming up. Goodyear, especially, is very sensitive, due to the fixed surplus.

	1913 Bid	1913 Asked	1914 Bid	1914 Asked
Ajax-Grieb Rubber Co., com	170	200	195	215
Ajax-Grieb Rubber Co., pfd	96	102	98	101
Aluminum Castings, pfd	98	100	97	100
Chalmers Motor Company, com	..	..	..	91
Chalmers Motor Company, pfd	..	..	90	93
Kelly Springfield Tire, com	13	14	38	40
Kelly Springfield Tire, pfd	50	60	106	108
Firestone Tire & Rubber Co., com	320	326	244	248
Firestone Tire & Rubber Co., pfd	104	106	102	104
Garford Company, preferred	100	102	80	90
General Motors Company, com	33½	34½	38	38½
General Motors Company, pfd	78	79	77	77½
B. F. Goodrich Company, com	67	68	23	24
B. F. Goodrich Company, pfd	104½	105½	80	81½
Goodyear Tire & Rubber Co., com	443	446	240	..
Goodyear Tire & Rubber Co., pfd	104½	105½	92	94
Gray & Davis Co., preferred	..	..	92	100
Hayes Manufacturing Company	..	90	..	..
International Motor Co., com	10	20	..	5
International Motor Co., pfd	40	60	..	15
Kelly-Springfield Motor Truck Co., com	..	..	40	60
Kelly-Springfield Motor Truck Co., pfd	..	..	90	105
Lozier Motor Company, com	..	..	..	15½
Lozier Motor Company, pfd	..	..	..	90
Maxwell Motor Co., common	..	..	3	3½
Maxwell Motor Co., 1st pfd	..	..	22¾	23¼
Maxwell Motor Co., 2nd pfd	..	..	7	7½
Miller Rubber Company	160	170	119	125
New Departure Mfg. Co., com	..	..	125	..
New Departure Mfg. Co., pfd	..	..	100	102
Packard Motor Company, pfd	103	106	92	95
Palmer & Singer, pfd	..	..	..	65
Peerless Motor Company, com	..	..	15	25
Peerless Motor Company, pfd	..	..	75	80
Pope Manufacturing Co., com	35½	36½	..	2½
Pope Manufacturing Co., pfd	79	80½	..	12
Portage Rubber Co., com	..	..	..	40
Portage Rubber Co., pfd	..	..	..	90
Reo Motor Truck Company	9	11	6¾	7¾
Reo Motor Car Company	19	21	14½	15½
Rubber Goods Mfg. Co., pfd	104	108	104	115
Russell Motor Car Co., com	..	..	..	40
Russell Motor Car Co., pfd	..	..	..	70
Splitdorf Electric Co., pfd	..	..	42	45
Stewart-Warner Speedometer Co., com	..	..	49	50
Stewart-Warner Speedometer Co., pfd	..	..	94	96
Studebaker Company, com	33½	35½	19½	20½
Studebaker Company, pfd	92	94½	70	71
Swinehart Tire Company	100	105	69	71
U. S. Rubber Co., com	..	..	58	58½
U. S. Rubber Co., 1st pfd	..	..	102	102½
Vacuum Oil Co	..	..	194	198
White Company, preferred	104	107	105	110
Willys-Overland Co., com	71½	72	58	61
Willys-Overland Co., pfd	99	100	83	90

DeLisser To Head Briscoe Motor Co.

Company Signs Contract for 5,000 Complete Chassis for 1914 and for 20,000 Thereafter

The American Voiturette Co. To Take Over the Manufacture of the Car-Nation and Keeton Cars

NEW YORK CITY, Jan. 6—At a meeting today of the Briscoe Motor Co. which has its executive offices in this city and its factory in Jackson, Mich. Horace DeLisser, of the Ajax-Grieb Rubber Co., was elected president and general manager. Mr. DeLisser will continue his present connection with the Ajax-Grieb Rubber Co., as well as looking after the Briscoe company, W. F. Smith was elected vice-president and sales manager and L. E. Latta, secretary and treasurer. Both of the latter were associated with the United States Motor Co. under Benjamin Briscoe, who is president of the Briscoe Motor Co., and who brought out the design of new car during the past year in Paris.

JACKSON, MICH., Jan. 2—Benjamin Briscoe, formerly president of the United States Motors Co., and a present heavy stockholder in the Ajax-Grieb Rubber Co., who returned from an extensive European trip recently, has signed contracts with the Lewis Spring and Axle Co. of this city calling for 5,000 complete chassis for the new Briscoe car during 1914, and for at least 20,000 chassis a year for the next 4 years.

The new car is described elsewhere in this issue of THE AUTOMOBILE. It is understood that it is planned to offer the car in the American market at a price under $700. The European demand is expected to take a large share of the output.

Jackson was selected as the point where the chassis could best be made, as it has excellent shipping facilities, and the large plant of the Lewis Spring and Axle Co. was in a shape to start out immediately to produce complete chassis and has the advantage of a well-perfected factory organization combined, making a great step toward the necessary goal of immediate production.

The plans of the organization contemplate the establishing of three assembling plants, one at a central shipping point in the east, one in the middle states, and one in the Far West. With standardization of parts, the chassis manufactured here will be shipped to the assembling plants, thus minimizing transportation costs and distributing the business.

American Voiturette Takes Over Keeton

DETROIT, MICH., Jan. 2—Arrangements have been made by the American Voiturette Co. to take over the manufacture of the Keeton car as well as to make the Car-Nation light car. Chas. B. Shaffer, of Chicago, president of the American Voiturette Co., a minority stock holder of the Keeton company, has taken over the Keeton by the newer company which is said to be well financed by Mr. Shaffer's associates in Chicago and New York. The Keeton car will be made in moderately small lots for the 1914 season. The production will be concentrated, however, chiefly on the Car-Nation light cars.

U. S. Rubber Declares Dividends

NEW YORK CITY, Jan. 3.—The board of directors of the United States Rubber Co. has declared from its net profits a quarterly dividend of 2 per cent. on the first preferred stock, a quarterly dividend of 1.5 per cent. on the second preferred stock, and a quarterly dividend of 1.5 per cent. on the common stock of the company, payable January 31.

G. M. Truck Co. Reduces Prices

DETROIT, MICH., Jan. 2—The General Motors Truck Co. have announced a new schedule of prices taking effect January 1. This schedule means a large saving to truck buyers, as heavy trucks, formerly selling for $4,500, will now sell at about $3,000, while the lighter capacity vehicle at $3,250 is now $2,250.

In explaining this move W. L. Day, vice-president and general manager of the General Motors Truck Co., says that the amount of "free" service, which was necessary for the truck manufacturers to furnish in the early days, is now a thing of the past, due to the standardization of truck design and manufacture. While the trucks were in the experimental stages it was necessary to cover the service overhead, in the price of the car. The buyers are now being given the advantage of the economies resulting from improved methods of construction.

Long Increases Capital $1,000,000

DETROIT, MICH., Jan. 2—The Long Mfg. Co., of Detroit, announces through Mr. J. L. Dryden, secretary and treasurer, an increase in the capital stock from $300,000 to $400,000. It is said that the assets of the company more than warrant the amount of the increase and that this action will permit the assuming of some very large 1914 contracts. Within the past year the company has moved into a modern concrete factory on the East Grand Boulevard. Their product is known as the Long System of Cooling and Radiation.

Dayton Cyclecar Co. Organized

JOLIET, ILL., Jan. 2—The Dayton Cyclecar Co., Joliet, Ill., organized by W. O. Dayton, Joliet, will build a car to sell for $375 and is now seeking a plant.

NEW YORK CITY, Jan. 5—In auditing members' and dealers' freight bills the Chamber of Commerce has found that many shipments described as automobile parts and charged by the railroads as first class actually consist of articles that come under the second class and would have been charged second-class had they been properly rated, this mistake having resulted in a considerable loss to the shippers.

NEW YORK CITY, Jan. 5—The Official Classification Committee, representing the railroads east of the Mississippi and north of the Ohio river, has changed the freight rating on radiators, speedometers and similar parts listed under these heads so that the list of parts that can be shipped second and fifth class is greatly enlarged. This change will result in a great saving to manufacturers and dealers in these articles. The new rating will go into effect on February 1.

Market Changes of the Week

No changes of any importance occurred in this week's market reports. Tin dropped $0.25, closing at $36.75, an advance of $0.35 over the previous day. There was some interest in nearby positions, but sales of importance. The copper demand was light. There were more offerings of electrolytic for January, February and March, but the consumers are waiting for lower prices. Lead was dull but steady. On call at the Metal Exchange, $4.15 was bid. A stronger tone developed in the world's leading crude markets on Tuesday, but aside from this there was an absence of interesting developments, and the underlying situation showed no change. Fine Up-River Para showed a gain of $0.03 1-2. The situation in the market for scrap rubber has undergone no change.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.	.06	.06	.06	.06	.06	.36	.....
Beams & Channels, 100 lbs.	1.31½	1.31½	1.31½	1.31½	1.31½	1.31½	.....
Bessemer Steel, ton	20.00	20.00	20.00	20.00	20.00	20.00	.....
Copper, Elec., lb.	.14¾	.14¾	.14¾	.14½	.14½	.14½	— .00½
Copper, Lake, lb.	.14⅞	.14⅞	.14⅞	.14¾	.14¾	.14¾	— .00⅛
Cottonseed Oil, bbl.	6.67	6.66	6.63	6.60	6.69	6.72	+ .05
Cyanide Potash, lb.	.17	.17	.17	.17	.17	.17	.....
Fish Oil, Menhaden, Brown	.39	.39	.39	.39	.40	.40	+ .01
Gasoline, Auto, 200 gals.	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	.....
Lard Oil, prime	.93	.93	.93	.93	.93	.93	.....
Lead, 100 lbs.	4.15	4.15	4.15	4.15	4.15	4.15	.....
Linseed Oil	.52	.52	.52	.52	.52	.52	.....
Open-Hearth Steel, ton	20.00	20.00	20.00	20.00	20.00	20.00	.....
Petroleum, bbl., Kansas crude	1.03	1.03	1.03	1.03	1.03	1.03	.....
Petroleum, bbl., Pa., crude	2.50	2.50	2.50	2.50	2.50	2.50	.....
Rapeseed Oil, Refined	.62	.62	.62	.62	.62	.62	.....
Rubber, Fine Up-River, Para	.73	.73	.73	.76	.76	.76½	+ .03½
Silk, raw Italy	....	5.10	....	....	5.10	5.10	.....
Silk, raw Japan	....	4.03	....	....	4.03	4.03	.....
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	37.00	36.68	36.78	36.63	36.40	36.75	— .25
Tire Scrap	.05	.05	.05	.05	.05	.05	.....

Dealers Expect Increase In Sales for 1914

Opinions from Agents in Leading Cities Indicate That Problem for Coming Year Is To Make Enough Cars to Supply Demand

CHICAGO, ILL., Jan. 6—As far as local dealers in motor cars are concerned, the term "Happy New Year" is neither a platitude nor a bromide. It almost approaches a realized promise of prosperity for 1914.

According to the majority of the dealers, the demand for motor cars in Chicago and environs was never as great as it is at the present time. There is every evidence to lead them to believe that the passage of the currency bill has relieved materially the tightness, fancied or real, of the money market that had a tendency to constipate sales and delay shipments to branch agents in the waning days of late-lamented 1913.

"Measured by the number of motor car sales, 1914 will be a much better year than was 1913 because of better business conditions," is the prophecy of Fred Warner, manager of the local Buick branch. "In Chicago and surrounding territory we will sell more cars than in the past year. At the factory the production for the months of November and December exceeded 8,000 cars and the manufacturing schedule for the winter and spring seasons of 1914 calls for a monthly output of 4,200 machines. Increased production means greater sales activity and we are not building a larger number of cars without the knowledge that there is a market for them.'

"I have not the slightest doubt but that 1914 will be a most profitable year for us," James Levy of the Chalmers Motor Car Co. of Illinois declared. Since the new models were announced in August, we have enjoyed the best business locally in our existence. I take off my hat to Chicago. It is the greatest motor car selling center in the country and more business radiates from it than from any other city in the United States.

"Speaking in regard to general conditions, I believe that the manufacturers, who have been building for the future, will continue to enjoy the same good business that they have in the past but that the factories that have only been building for the time being will have difficulty in marketing their products.

That the demand for motor cars is greater than ever before is shown in the number of October shipments from the Chalmers factory. In October, 1,111 cars were sent out by the maker, 251 more cars than in any one month since the organization of the Chalmers Motor Co.

Louis Geyler, local distributor for the Hudson, bases his optimism on statistics:

"I am just 3 1-2 months ahead of last year," he said. "My cash business from July 1 to January 1 is equal to that from July 1 to April 15 of the year previous. My December sales totaled 46 cars and that forty-sixth purchase just doubled my sales for 1913 over those of 1912. The clouds on the horizon are imaginary.

"The dealer in the high-priced car should not fear any untoward results from the lowering of the tariff on foreign machines. In the modern motor car market, Europe cannot compete successfully with America. We can give the car purchaser more value for his money, better service and in our products are embodied more progressive mechanical ideas."

Voicing the optimism of the local dealer in electric cars, D. E. Whipple, manager of the Chicago branch of the Anderson Electric Co. says:

"In Chicago and Evanston, the greatest of Detroit electric markets, we plan to sell 300 cars in 1914 and if we realize such an ambition, our sales for 1914 will double those of 1913. Advance sales and orders more than encourage us to believe that we will not be disappointed. The factory plans an output of 2,500 vehicles for this year, twice as many as were built in 1913. There is a constantly growing demand for the electric, a demand forced by the public and not the manufacturer. The consumer is coming to the realization that the electric is the ideal car for town and suburban use."

Pittsburgh's Prospects Good

PITTSBURGH, PA., Jan. 3—There is no alarm on the car situation. On the contrary her leading dealers are optimistic to a degree that has seldom been seen here. In the midst of an admitted industrial depression which naturally has hit the Pittsburgh district pretty hard owing to its being the world's great steel center, the automobile interests are firm in their belief that business is on the right track and that within a few months they will be enjoying by far the largest trade they ever had. Not only this, but totals now being compiled of this year's business with hardly an exception show a good gain over the preceding year. The fact is there is a very sound conservative basis for business at present.

Pittsburgh automobile agencies have had one of the best Christmases they ever enjoyed. A hearty tone of confidence prevails all their reports. Gains in sales are the rule and not the exception. Foremost in this respect is the Buick Motor Company whose manager reports that to date they are 25 per cent. ahead of last year. The Pittsburgh agency has taken all the cars that it could get from the Buick factory and has orders now which are 3 months old which have not been filled.

The Studebaker agency is very hopeful. "We look for a big year in 1914," said its manager. "Our sales are considerably above any previous year. October, November and December each beat all previous records for those respective months. We are now looking for additional storage space for we know that there is going to be a rush for cars in the spring."

The Ford Motor Car Co. which is almost a newcomer in Pittsburgh, has had 1,558 orders this year and delivered 402 cars. This is a gain of 150 per cent. over last year. Its manager announces that he anticipates a better business in 1914 by far than this year.

The Winton Agency says that the 1914 season so far is showing up away ahead of last season. They have fewer second-hand cars on hand than at this time last year.

The Packard Motor Car Co. reports business good. They are away ahead of last year. Since October 1st they have sold fifty cars which does not look as if high-priced cars were going to leave Pittsburgh for quite a time.

Business Brisk in Cleveland

CLEVELAND, O., Jan 3—Never has the industry in Cleveland given more promise than at present. Business is unusually good just now and all the local dealers are in accord that the alleged depressing condition supposed to have centered in the Middle West is a fallacy so far as this territory is concerned.

"There is nothing fundamentally wrong," said Charles W. Mears, of the Winton Motor Car Co. "Our own sales are increasing and we have every reason to feel pleased with the situation. Prospects are even brighter and after the first of the new year the automobile industry will see a pronounced boom."

Walter C. White, of the White Co. finds the situation in even better shape than this time last year and predicts prosperity for months to come.

Directors of the F. B. Stearns Company, at an adjourned meeting December 23, declared a cash dividend of 10 per cent. on the capital stock of the company. This is in addition to the 8 per cent. cash dividend paid July 1, 1913. The Stearns company has no preferred stock, and no bonds or mortgages outstanding.

As another evidence of prosperous condition the New York Central lines have recognized a promising future and on December 23 secured permission from the Ohio utilities commission to issue equipment trust certificates for more than $10,000,000 to buy 500 automobile shipping cars and other equipment.

Bob Allen, distributor for the Velie, is having great success in the way of 1914 sales. The first week of December he placed cars with twelve Clevelanders.

Washington Dealers Are Optimistic

WASHINGTON, D. C., Jan 3—Now that the currency bill has been enacted into law the feeling among automobile dealers here is that business will take a decided spurt after January 1. There seems to be no question but that the tariff and currency legislation while pending affected automobile sales to no little degree. As one prominent electric dealer explained it, "we have twenty-five or thirty live prospects who have been holding off buying for some unexplained reason. The only thing to which we can attribute their hesitancy is that they were afraid to buy

until the currency bill was disposed of. Now that that question has been settled we have every reason to believe these sales will be made within the next month."

Cincinnati Dealers Satisfied

CINCINNATI, O., Jan. 3—The most optimistic report from local headquarters comes from Harry S. Leyman, president of the Cincinnati Dealers' Assn., and district manager of the Buick company. Mr. Leyman has his books to show that he disposed of 500 more cars this year than he did last, the increase being over 75 per cent. He has orders in fo more cars right now than the factory is willing to let him have. Two car loads were recently unloaded and the next shipment is expected within the next few days.

There are more dealers in Cincinnati now than ever before. Few cars are not represented. The majority of the reports going into the factories certainly overshadow some of these pessimistic remarks, at least that the way the local condition sizes up.

Good Business in Bay State

BOSTON, MASS., Jan. 3—The motor dealers in Boston who have been in business for some years handling lines of cars that have become known, state that the general talk of business depression has not seemed to affect them to any great extent. In the higher class the three P's, Pierce, Packard and Peerless, show a larger total of business up to November 1 of this year than for the entire 12 months of 1912. In this same class the Locomobile, too, with its trucks and cars is ahead of a year ago. The Stevens-Duryea selling cars alone has increased its business. Then there is the White that has just moved into one of the largest sales and service departments in the city, an evidence of its prosperity. The Stearns, also, is gaining, and additional salesmen have been put on.

The Marmon sales are better than a year ago, and they are expected to be even more so. The Cadillac is selling well, and this week it is having a special show. The Hudson, Rambler and Chalmers, report business good and the prospects better. As for the Ford, that car is selling faster than ever.

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Eleven States for Uniform Legislation

NEW YORK CITY, Jan. 5—A Wilmington, Del., man has been selected to draft a law that will be submitted to the legislatures of eleven states for enactment, for the purpose of securing uniform automobile legislation. The states are New Jersey, New York, Pennsylvania, Massachusetts, Delaware, Maryland, Connecticut, Rhode Island, New Hampshire, Maine and Vermont. A penalty for reckless driving, when death results, is one of the important provisions to be included in the proposed law.

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To Test New Arizona Law

PHOENIX, ARIZ., Jan. 2—Claiming that to assess an automobile as personal property and also to charge a license tax for its operation is double taxation, the Arizona Motor Co. of Phoenix has announced that it will test the new Arizona Automobile law. Many persons who have taken out licenses for 1914 have paid the increased fees under formal protest. The registration fee has been practically doubled for many automobile owners. Under the old law the fee was $5 a year for every machine under 40 horsepower, A. L. A. M. rating. No attention was paid to the A. L. A. M. rating provision, however, and owners of cars rated above 40 horsepower by the manufacturers paid $10. Under the new law the fee is $5 up to 25 horsepower, A. L. A. M. rating, $10 up to 40, and $15 above that figure.

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Higher Fees for Passenger-Delivery Cars

HARTFORD, CONN., Jan. 2—Those owners of passenger cars in Connecticut who have been in the habit of using their machines for light delivery were greatly surprised when Attorney-General John H. Light ruled that such cars must be licensed under pleasure vehicle rates. The state fee for passenger cars is 50 cents per horsepower. The rate on commercial cars is $7 for 1,400 pounds, and $3 per each thousand pounds additional.

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New Company to Make Indoor Electric Truck

ST. LOUIS, MO., Jan. 2—The Electromobile Co., of St. Louis, was organized during the past week to manufacture an electrically driven indoor truck that, it is claimed, will be a great aid to the larger wholesale houses and manufacturing plants in carting about materials to different parts of their buildings. The company was organized by Sanford J. Bernheimer with a capital stock of $100,000, one-half of which is already taken. Ralph Kalish, a patent lawyer, is secretary and treasurer of the company.

The truck is operated by a driver, who stands at one end of the vehicle, where the controls are located. The truck has a carrying capacity of 2,000 pounds and a tractor capacity of from 5,000 to 8,000 pounds. It measures 8 feet over all, with a loading space of 7 feet.

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Automobiles of Non-Residents Untaxable

FRANKFORT, KY., Jan. 5—Section 7 of the automobile law exempting from license tax motor vehicles of non-residents who pay license in their own states was declared constitutional by the Court of Appeals in the case of the City of Newport against Merkle Bros., of Cincinnati, who secured an injunction in the Campbell Circuit Court, preventing the police judge from fining the company for refusing to take out a Newport license on their motor trucks which deliver goods to Newport customers.

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U. S. Tire Branch Adds $1,000,000

INDIANAPOLIS, IND., Jan. 2—Notice has been filed with the Indiana secretary of state that the G. and J. Tire Co., which is the Indianapolis branch of the United States Tire Co., has increased its capital stock from $1,000,000 to $2,000,000. The additional capital is in preferred stock. The Western Motor Company of Marion, Ind., has filed notice that its capitalization has been reduced from $400,000 to $1,000. The Rutenber Electric Company, Logansport, has issued $35,000 worth of preferred stock.

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Lavigne Cyclecar Co. Leases Factory

DETROIT, MICH., Jan. 2—The Lavigne Cyclecar Co., of Detroit, has signed a lease for factory space at Commonwealth avenue and the Grand Trunk Railway. They have also made arrangements for the leasing of space to accommodate other companies who will manufacture parts for their car. This cyclecar, designed by J. P. Lavigne, will be offered in three models: the roadster, the cabriolet and a business wagon. The roadster is listed at $425 and the cabriolet at $650. Contracts for parts have been let looking to active deliveries of cars on March 1.

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Gray & Davis Takes Over New Headlight

NEW YORK CITY, Jan. 7—Gray & Davis, Boston, Mass., have taken over the control of a non-blinding electric headlight, described in THE AUTOMOBILE, October 30, 1913, and invented by Otto Luyties. This headlight differs from the conventional type in that the lens, instead of being flat, is dome shaped. In place of ordinary glass, frosted glass is used which produces a diffused light, showing only a small bright spot at the center. This does not produce a blinding effect because of the dimmer light surrounding it. Besides the non-glaring feature this light has the additional advantage of rendering side lights unnecessary, as they illumine the sides of the road.

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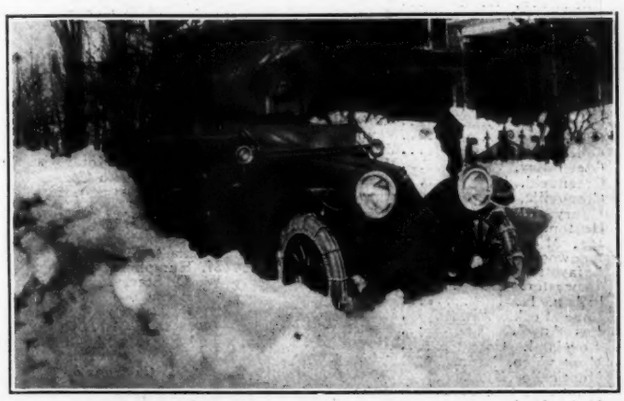
Bob Burman Building Twelve Racing Cars

NEW YORK CITY, Jan. 7—Bob Burman, who is in this city visiting the show, states that he is building twelve racing cars of his own design, with Wisconsin motors, for W. A. Thompson of Battle Creek. Two of these will be entered in the Indianapolis race.



E. R. Nelson, Ishpeming, Mich., with his Franklin 6—30 demonstrator using Weed chains. Sold four 6—30 Franklins the day after the big snowstorm of Nov. 10

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

ARCADE, N. Y.—Arcade M. C. Co.; capital, $15,000; to deal in automobiles. Incorporators: K. R. Wilson, F. R. Wilson, A. M. Wilson.

BIRMINGHAM, MICH.—W. S. Truck Co.; capital, $30,000; to manufacture motor trucks. Incorporators: J. J. Weier, E. R. Smith.

BOSTON, MASS.—Stutz M. C. Co.; capital, $30,000; to deal in automobiles. Incorporators: M. P. Chase, A. R. Philey, M. F. Chase.

BUFFALO, N. Y.—Leitze Incorporated; capital, $10,000; to manufacture motor vehicles. Incorporators: E. Leitze, E. P. Leitze, C. A. Cairns.

CAIRO, ILL.—Cairo Auto Sales Co.; capital, $2,500; to deal in automobiles. Incorporators: J. P. Glynn, J. J. Glynn, A. D. Teer.

CHICAGO, ILL.—Stegeman Motor Truck Corp.; capital, $10,000; to deal in motor trucks. Incorporators: F. H. Burkland, R. C. Flodin, E. Burkland.

JOHNSONVILLE, N. Y.—Abbott-Akin Co.; capital, $10,000; to deal in automobiles. Incorporators: E. H. Abbott, John Slade, H. V. Akin.

KANSAS CITY, Mo.—National M. C. Co.; capital, $3,000; to deal in automobiles. Incorporators: H. F. Sundin, H. E. Hunt, L. H. Gaskell.

LANSING, MICH.—Steel King M. C. Co.; capital, $100,000; to deal in automobiles. Incorporators: E. S. George, S. T. Craple.

NEW YORK CITY—American Motor and Transmission Co.; capital, $50,000; to deal in automobile motors and transmissions. Incorporators: C. H. Bassford, E. V. Nixon, Eustace Reynolds.

NEW YORK CITY—L. A. Van Patten; capital, $60,000; to deal in automobiles. Incorporators: Alfrieda G. Thaanum, Frank Disch, Russell Goldman.

NEW YORK CITY—Town Taxi Co.; capital, $5,000; to manufacture taxicabs, etc. Incorporators: J. N. Scelsa, J. F. Dempsey, E. A. Donohue.

PUNXSUTAWNEY, PA.—McQuown Auto Co.; capital, $5,000; to deal in automobiles. Incorporators: H. Ward McQuown, S. C. McQuown, Robert Bridge.

ST. LOUIS, Mo.—Trenton M. C. Co.; capital, $10,000; to deal in automobiles. Incorporators: J. A. Angert, A. F. Becker.

UTICA, N. Y.—Utica Saxon Motor Corp.; capital, $10,000; to deal in automobiles. Incorporators: W. D. Lyon, J. W. Seaton, W. P. S. Doolittle.

WAYNE COUNTY, MICH.—Rex Motor Co.; capital, $75,000; to deal in automobiles. Incorporators: C. H. Riopelle, W. J. Frasier.

WILLIAMSTON, N. C.—A. R. Biggs Iron & Motor Co.; capital, $25,000; to deal in motors. Incorporators: S. B. Biggs, J. W. Biggs and others.

WILMINGTON, DEL.—Briscoe Motor Co.; capital, $500,000; to deal in automobiles. Incorporator: H. E. Latter.

YOUNGSTOWN, O.—Dietrich Motor Car Co.; capital, $15,000; to purchase, repair and sell automobiles and motor cars. Incorporators: Dale Dietrich, Albert Dietrich, Frank Dietrich, C. S. Dietrich.

GARAGES AND ACCESSORIES

BOSTON, MASS.—Worcester Tire Fabric Co.; capital, $50,000; to deal in automobile tires. Incorporators: A. D. Sykes, Peter Reilley.

BROOKLYN, N. Y.—Oriental Rubber & Supply Co.; capital, $10,000; to deal in tires and rubber goods. Incorporators: Homer G. Martin, C. Roy Gedney, Richard F. Lucey.

BUFFALO, N. Y.—Barnard-Michael Tire Co.; capital, $10,000; to manufacture automobile tires. Incorporators: R. S. Barnard, Isidore Michael, S. M. Michael.

CHICAGO, ILL.—Polack Rubber Co.; capital, $2,500; to deal in automobile tires. Incorporators: G. B. Cohen, A. Gross, M. Polack.

CHICAGO, ILL.—Tire Co. of America; capital, $10,000; to deal in automobile tires. Incorporators: Milton Reinsberg, M. J. Golden, Issie Johnston.

CHICAGO, ILL.—Uno-Lamp Co.; capital, $2,500; to manufacture automobile lamps. Incorporators: O. R. Barnett, P. H. Truman, H. M. Gillespie.

CINCINNATI, O.—Ten Broeck Tyre Sales Co.; capital, $10,000; to buy, sell and deal in automobile tires and tubes. Incorporators: R. T. Diarett, Herbert C. Wyson, W. L. Lehman, John E. Bunce, J. H. Brownell.

DETROIT, MICH.—Advance Gear Co.; capital, $50,000; to deal in steering gears. Incorporators: J. P. Lavigne, C. O. Barnes.

LACROSSE, WIS.—LaCrosse Motor Truck Co.; capital, $10,000; to establish a transfer and drayage system in LaCrosse, starting with three trucks. Incorporators: F. J. Nootzel, Herbert Lewis, W. H. Ristow.

NEW YORK CITY—Auto Accessories Assn.; capital, $10,000; to deal in automobile accessories. Incorporators: Samuel Falk, H. C. Falk, E. E. Braendle.

NEW YORK CITY—Covent Garden Garage; capital, $40,000; general garage business. Incorporators: W. E. Thompson, A. P. Coburn, C. A. Forshew.

NEW YORK CITY—De Vere and Strang; capital, $10,000; to manufacture and deal in machine supplies. Incorporators: F. M. De Vere, E. L. De Vere, K. P. Strang, Fred M. Strang.

NEW YORK CITY—Keaton Tire & Rubber Co.; capital, $1,000. Incorporators: Harold A. Forbes, Wm. J. Kreuder, Thos. F. MacMahon.

NEW YORK CITY—Meyers & Grayson, Inc.; capital, $25,000; to manufacture and deal in tires, tubes, etc. Incorporators: Morris Meyers, S. J. Grayson, Mary Ginsburg.

NEW YORK CITY—Peerless Motor Specialty Co.; capital, $1,500; to deal in automobile accessories. Incorporators: H. E. Spencer, Gustave Weinberg, E. M. Culp.

NEW YORK CITY—Wadsworth Auto Repair Shop; capital, $2,000; to repair automobiles. Incorporators: J. D. Flynn, George Beverly, James Farrell.

ST. CATHARINES, ONT.—Consumers Tire & Rubber Co., Ltd.; capital, $800,000; to deal in automobile tires. Incorporators: A. W. Marquis, W. M. Marquis.

SPRINGFIELD, O.—Baker Auto Transit Co.; capital, $10,000; to operate an auto bus line between South Charleston and Jeffersonville and between South Charleston and Sedalia. Incorporators: G. W. Baker, W. W. Keifer, Floyd Baker.

ST. LOUIS, Mo.—Bittel-Leftwich Tire Service Co.; capital, $25,000; to deal in automobile tires. Incorporators: C. G. Bittel, B. O. Leftwich, C. C. Guenther.

ST. LOUIS, Mo.—Panama Rubber Co.; capital, $12,000; to manufacture and deal in all kinds of rubber goods. Incorporators: C. G. Schwartz, G. G. Giese, F. W. Sanner.

TACOMA, WASH.—Jones Auto Lock Co.; capital, $250,000; to manufacture and sell a locking device for automobiles to prevent thefts and stolen joy rides. Incorporators: J. T. Powers, John D. Fletcher, Robert E. Evans.

TROY, N. Y.—Aird Motor Co.; capital, $10,000; automobile accessories. Incorporators: J. W. Aird, A. A. Aird, A. W. Aird.

WACO, TEX.—United Auto Supply Co.; capital, $5,000; to deal in accessories. Incorporators: R. S. Keyser, S. Zeve, S. W. Wexler.

CHANGES OF NAME AND CAPITAL

COLUMBUS, O.—Motor Owners' Supply Co.; change of name to the Columbus Automobile Supply Co.

LOUISVILLE, KY.—Yager Motorcar Co.; capital, increased from $6,000 to $8,000.

New Agencies Established During the Week

PASSENGER VEHICLES

Place	Car	Agent
Aberdeen, S. D.	Franklin	Aberdeen Auto Supply Co.
Apache, Okla.	Maxwell	Heriff & Loftin.
Aplington, Ia.	Oakland	Meyer Bros.
Artisia, Cal.	Maxwell	E. A. Wheelock.
Ashland, Wis.	Oakland	Thos. McMahon & Son.
Ashton, Ill.	Moon	W. Petersmeyer.
Athens, Wis.	Studebaker	Athens Implement Co.
Bangor, Me.	Oakland	Brown & White.
Concord, S. I.	Oakland	Louis Blum.
Cortland, N. Y.	Oakland	D. Gladding & Co.
Delaware, N. J.	Maxwell	Duckworth & Quig.
Dumont, Ia.	Oakland	Pfaltzgraff Bros.
Edgewood, Ia.	Oakland	L. B. Blanchard.
Elkville, Ill.	Meteor	E. Bass.
Ellensburg, Wash.	Maxwell	Kittitas Automobile Co.
Eugene, Ore.	Maxwell	Independent Garage.
Eureka, Cal.	Oakland	Eureka Auto Co.
Farmington, Mo.	Metz	John L. Swind.
Florence, S. C.	Oakland	G. C. Chandler.
Fort Dodge, Ia.	Westcott	P. J. Tierney.
Frankfort, Ky.	Oakland	Frankfort Motor Car Co.
Galatea, Ill.	Maxwell	Hall & Quick.
Geneva, N. Y.	Maxwell	Geneva Auto Co.
Gillespie, Ill.	Haynes	C. P. Hamlin.
Gillespie, Ill.	Metz	C. P. Hanlin.
Green Bay, Wis.	Maxwell	Conley Judd Motor Car Co.
Greenfield, Ia.	Maxwell	Chambers Auto Co.
Greenville, Mich.	Maxwell	Hansen & Lyman.
Henry, Ill.	Moon	J. E. Barry.
Horton, Ia.	Oakland	F. R. Boyd.
Ida, Mich.	Maxwell	Ida Garage.
Ironwood, Mich.	Oakland	Nikula & Makela.
Lafayette, Colo.	Maxwell	M. Humphries.
Lancaster, Mo.	Meteor	W. O. Stacey.
Lisbon, Ia.	Oakland	Geo. Staab.
Lone Rock, Wis.	Maxwell	B. M. Dewey.
Los Angeles, Cal.	Westcott	The C & S Auto Co.
Loveland, Colo.	Maxwell	Anderson, Griffin & Alsbury.
Montevideo, Minn.	Oakland	J. H. Seeley.
Monticello, Ky.	Oakland	Rex G. Carpenter.
Montrose, Cal.	Maxwell	Rainbow Route Auto Co.
Muir, Mich.	Maxwell	Sykes & Dilley.
Neenah, Wis.	Franklin	J. F. Stroebel.
New Brunswick, N. J.	Oakland	John Buckelew.
North Yakima, Wash.	Maxwell	M. D. Baker Motor Car Co.
Oshkosh, Wis.	Franklin	Hoaglin Auto Co.
Princeton, Ill.	Oakland	Hans Sandburg.
Redondo Beach, Cal.	Maxwell	C. A. Wheeler.
Richmond, Ind.	Westcott	The Theno Auto Co.
Riverside, Cal.	Maxwell	Ed. L. Pequequat.
Rockford, Ia.	Oakland	W. H. Talbot.
Rockwood, Mich.	Oakland	Austin B. Chapman.
Salida, Colo.	Maxwell	Ideal Auto Co.
Shelton, Wash.	Maxwell	J. C. Pauley.
Sherman, Cal.	Maxwell	W. A. Nicholl.
Sioux City, Ia.	Oakland	E. A. Christensen.
Sioux City, Ia.	Westcott	Hoeven Auto Co.
Skidmore, Mo.	Oakland	C. E. Graves.
Stockton, Cal.	Oakland	A. Bonzi.
Strong City, Okla.	Maxwell	Francis Walker.
Sumner, Ia.	Oakland	E. W. Ferrand.
Tacoma, Wash.	Maxwell	George R. Green.
Tranquility, N. J.	Oakland	I. L. Labar.
Troy Grove, Ill.	Maxwell	J. W. Weldon.
Valley Park, Mo.	Dorris	A. Stigerwald.
Valparaiso, Chili	Kisselkar	Haart-McKinlay & Co.
Vancouver, Wash.	Maxwell	Frank Willcox.
Van Wert, O.	Maxwell	Gilliland & Garn.
Vidalia, Ga.	Maxwell	E. L. Meadows.
Vineland, N. J.	Maxwell	Edson & Unsworth.
Visalia, Cal.	Maxwell	James L. Robertson.
Waco, Tex.	Maxwell	Garrett Hdwe. & Imp. Co.
Waco, Tex.	Oakland	W. L. Burk.
Walled Lake, Mich.	Maxwell	G. E. Dickerson.
Walnut Grove, Minn.	Maxwell	F. W. Schauer.
Washington, D. C.	Oakland	The Pollock Car Corp.
Washington, D. C.	Krit	P. L. Paylor.
Wausa, Neb.	Maxwell	Otto Hult.
Weatherford, Tex.	Maxwell	E & L Garage.
Weatherford, Tex.	Oakland	Richards & Putnam.
Webster City, Iowa	Kisselkar	Buell & Co.
Weiser, Idaho	Oakland	Osborn & Higby.
Wellsville, O.	Maxwell	Wellsville Auto Co.
West Sunbury, Pa.	Kisselkar	W. P. Hillard & Son.
Wisner, Neb.	Maxwell	West Bros.
Weston, O.	Oakland	Charles Roe.
Winthrop, Ia.	Oakland	Winthrop Auto Co.
Woodbine, Ia.	Maxwell	Tague Bros.
Zeeland, Mich.	Maxwell	Lamer Bros.

COMMERCIAL VEHICLES

Place	Car	Agent
Baltimore, Md.	Garford	G. P. Kurtz.
Washington, D. C.	Garford	G. P. Kurtz.

Fashion and Design at the Importers' Salon

(*Continued from page 118.*)

In the small runabout and five-passenger touring cars that form part of the Lion-Peugeot exhibit, the motors are cast four in a block, but instead of having the cylinders arranged in a row they are in two Vs. The motor casting has a cubic appearance as the jackets are square.

Fiat Shows Imported Chassis

Three imported Fiat chassis are on the Salon floor, fitted with bodies of American manufacture. A Holbrook limousine on one of the Fiat chassis is particularly noticeable in that it is a beautiful adaptation of the curved roof design. The Fiat 20 motor has 3.93 by 5.51-inch cylinders cast in a block providing a simple compact exterior. The disk clutch and forked yoke torque construction recently described in THE AUTOMOBILE are identical with the American product of this concern. Pressure feed gasoline is used on this car, following the general European practice.

Bugatti a Unique Car

Selling for $2,500 in the three-passenger model and $2,700 in the four-passenger the little Bugatti car which looks more like a toy than a real automobile is attracting a large share of attention. Cantilever springs placed butt to butt are used on the 94.5-inch wheelbase chassis. The motor is a block cast 65 by 100 millimeters with overhead rotary valves operated by a horizontal shaft running along the tops of the cylinders.

Only the three-passenger bodies are exhibited and these have a triangular seating arrangement in which the driver sits farthest ahead, the forward passenger sits to the left and just a trifle back of him and the rear passenger sits in the center of the car over the rear axle. The car is said to be capable of a sustained speed of 50 miles an hour.

Mercedes Shows a Knight

Two representatives of cars equipped with Knight motors are at the Salon. These are Minerva, which has Knights exclusively, and Mercedes, which is shown in both Knight and poppet types. The Mercedes-Knight chassis on the floor is a 45. Little, from a mechanical standpoint, can be learned from the cars shown here as no stripped chassis are on view. The adaptations of the body work are excellent examples of progress in this respect. A novelty at the Mercedes stand is a speedster in white. Cover plates are used over the spokes in this car giving a disk-wheel appearance. Another touch adding to the racy appearance is given by the fold-up steps, one of which is illustrated.

S. G. V. with Electric Gearshift

The S. G. V. car, with its foreign cast, does not seem out of its element at an exhibit of imported machines. The American tendencies of the day are exemplified in the car, however, and showed as contrasts to the European cars surrounding it. Left drive, center control and the electric gearshift have a non-European appearance that makes the S. G. V. exhibit stand out from its neighbors. In the body work the European touch is apparent. A stripped chassis is provided for a study of the details of construction and the much-talked-of gearshifting mechanism is exposed to view through a glass cover plate. A point that may be noted on the chassis is the use of cables for brake control.

An innovation in the way of an accessory exhibit makes the show more complete. The foreign tires have a strong representation and it is very probable that, with the recent tariff reduction, these foreign concerns will make a strong bid for American business. The tire concerns at the Salon are Gaulois, Prowodnick and Faure. Dunlop shows both the tire and the demountable wire wheel. The Crown Prince steel wheel, a German product, is shown and the A. J. Picard Co. has an extensive line of accessories on view.

Delaunay-Belleville a Body Exhibit

The Delaunay-Belleville is a body exhibit pure and simple, all the cars being fitted with luxurious bodies and no stripped chassis being paced on exhibition. One little point that deserves mention owing to the fact that it promotes the general inclination towards accessibility is the opening in the bonnet through which the carbureter may be reached for adjustment without raising the entire piece. Owing to the cylindrical shape of the forward end of these cars this construction is particularly advantageous.

Moline-Knight Motor Finishes 336-Hour Run

(*Continued from page 127.*)

Thomas & Thomas, Kenilworth, England, consulting engineers for Knight & Kilbourne and some of their licensees. This is the first Knight type motor using block castings with integral inlet and exhaust manifolds and pressure lubrication in which oil is forced at different pressures to the grooveless crankshaft bushings and thence through the drilled crankshaft. The motor is the first of the Knight types to be cooled by thermo-syphon.

Bridges in Ports Eliminated

The arrangement of the two reciprocating sleeves in each cylinder is standard excepting in that the bridges in integral jacketed inlet and exhaust ports are omitted. The eccentric shaft, which drives the sleeves, is in turn driven by silent chain drive as used on all Knight types, but differs in that an adjustment for this chain is provided in the construction. An important feature of the cylinder design is that the detachable heads are so designed as to entirely eliminate external water piping between the cylinder head and the cylinder wall, this new Thomas design leaving an open water space between the jacket space in the head and that in the wall.

The weight of the complete motor and parts is given below:

	Pounds
4 Pair sleeve connecting rods, including gas tank pressure pump	10.6
4 Inner sleeves and pins	36.5
4 Outer sleeves and pins	30.4
4 Pistons with wristpins and rings	15.8
4 Connecting rods, complete with bolts and nuts	22.7
4 Cylinder heads	27.3
1 Cylinder casting, with studs and nuts	130.4
1 Cover for cylinder, 4 syphon tubes, 4 fiber insulating tubes and 4 lock nuts and washers	7.8
1 Carbureter	6.0
4 Spark plugs and gaskets	1.1
1 Fan with support and breather cap	7.9
1 Flywheel	116.6
Intake water manifold	4.5
Lower half of crankcase, bolts and nuts	31.0
Chaincase cover, oil pump and pipes	9.6
Top half of crankcase, including crankshaft, magneto, magneto wires, air pump for gas tank, oil pipes, chain sprockets bearings, studs and nuts	232.5
Total weight	690.7

Moline Company Stakes $10,000 on Challenge to Poppet Motor Makers

NEW YORK CITY, Jan. 7—Relying upon showing made by four-cylinder Moline-Knight in the recent A. C. A. test, the Moline Automobile Co. issued yesterday a challenge to makers of poppet engines to duplicate that record. Moline Co. deposited $10,000 to be forfeited to any maker of poppet valve motors whose engine will duplicate the Moline record, test to be held at the A. C. A. testing laboratory and under the same conditions as Moline test. Challenge is open to any poppet regardless of price, displacement, horsepower or number of cylinders, the entrant to deposit a like amount as forfeit.

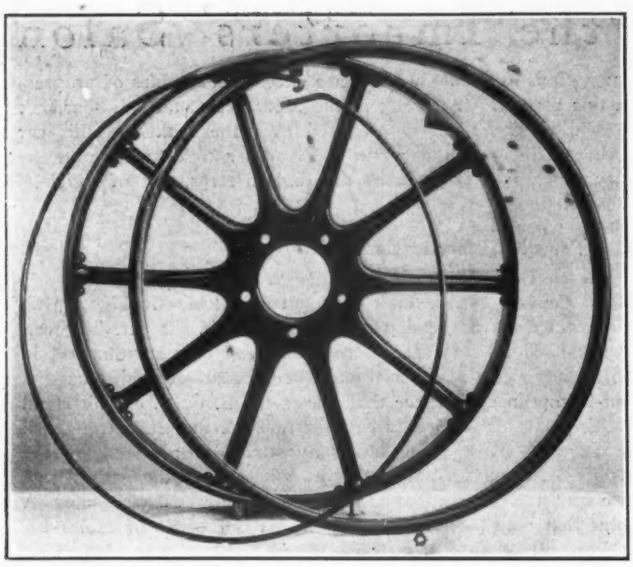


Fig. 1—The ring on which the tire is mounted on the Crown Prince steel wheel is held in place by a loop, one end of which is bent into a hook. The other end is threaded and slips through the projection shown, where it is secured by a nut

A Steel Wheel for Passenger Car Use

Crown Prince Said To Be Lighter and Stronger Than Wood

THE average automobilist has nearly always associated the steel wheel with the heavy motor truck, although several designs have been produced for the use of passenger vehicles. At the New York shows another type of pressed steel wheel for passenger vehicles is revealed to the general public for the first time. This is the Crown Prince wheel, which is a German importation, brought to this country about 8 months ago by Max Bachem, who is the sole United States licensee, and who has headquarters in Detroit.

The Crown Prince wheel, which is made to fit any standard straight side, clincher or quick detachable tire in all inch and millimeter sizes, is scarcely distinguishable in appearance from the average wood wheel. It is made with ten and twelve spokes.

The demountable feature is not lost sight of. There are five bolts which run through the hub portion of the wheel from the inner flange which is a part of the hub. Then after the wheel proper is in place, an outer flange is slipped over the ends of the bolts and finally lock nuts secure the whole assembly rigidly. But with this construction alone, the entire drive would be taken by the five through bolts. So in order to take this driving strain from them, a friction plate is interposed between the inside flange and the inner side of the wheel center. This plate has much the same surface as a file and digs into the metal of the wheel, establishing a driving connection and supplementing the work of the bolts.

Ingenious Method of Removing Ring

The provision for removing the ring on which the tire is mounted is also ingenious. It is held in place by a split hoop, one end of which is bent into hook form. After the tire ring has been slipped onto the rim of the wheel, the hooked end of the hoop is slipped into a hole in the rim and brought around in its groove to the projection shown in Fig. 1, which is an integral part of the rim. This projection is drilled to take the other end of the band ring or hoop which is threaded. Having slipped this end through the projection, a nut is screwed on and the hoop can then be easily drawn down tight around the rim. This is a very simple and effective construction, since it is only necessary to engage one or two threads of the hoop end with a nut when all the tightening is easily done by screwing down this nut.

This steel wheel is also made without this detachable feature as well. A great fault with some demountables and clincher constructions, for that matter, is that the rim is not watertight. That is, moisture gets in between the rim and the tire beads and serves either to rot the rubber, since there is not much chance for it to dry out, or to rust rim and tire together sometimes so badly that it is a very difficult job to get the latter off. To eliminate this objection, the Crown Prince wheel is fitted with a water-tight packing ring which rests on the bottom of the rim or the bottom of the clincher ring as the case may be, and when all is properly assembled and the holding hoop securely in place there is no chance whatever for moisture to leak in between rim and tire to do damage, it is said.

The Crown Prince is claimed to be about 200 per cent. stronger than wooden wheels and at the same time is lighter, presents less ridges and grooves to collect dirt and is therefore better looking when in service. The licensee of this wheel cited a test made some time ago, wherein the steel wheel was shown to withstand a pendulum lateral blow of 10 1-2 tons force while a wood wheel stood up under only 4 tons. This would indicate a great factor of safety.

A Crown Prince 37 by 5 is 25 pounds lighter than a corresponding wood wheel, it is stated, while a 34 by 4 has 15 pounds advantage over a 34 by 4 wooden type. As compared with the wire wheel, its weight is given as about the same for the same sizes. For instance, a Q. D. 36 by 4 1-2 Crown Prince weighs 45 pounds, while a wire wheel of the same dimensions weighs 40 pounds. The clincher steel wheel of this size tips the scales at 29.5 pounds. These figures were furnished by the Crown Prince representative.

Has No Flywheel Effect

Since the Crown Prince wheel has no heavy outer rim, it is said to have no flywheel effect. That is, when starting or stopping, there is no inertia force serving to retard the movement of the vehicle, due to any heavy mass at the outside of the wheels. The cooling feature which the metal spokes afford is also set down among the advantages. These serve to carry away the heat generated in the tires.

The Crown Prince wheels are adaptable to cars now having wood wheels. They can be used by adapting the old style straight hub and inner flange to them, or new Crown Prince hubs can be fitted having a slight taper toward the end so as to make the taking off of the wheels an easy matter. With the demountable feature, this is of course desirable.

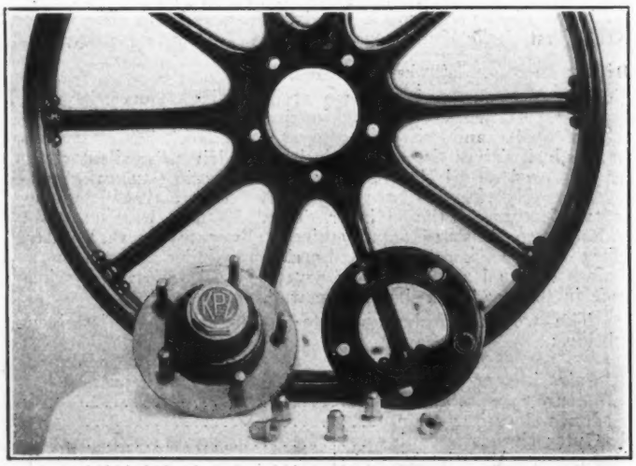


Fig. 2—Crown Prince steel wheel partly disassembled